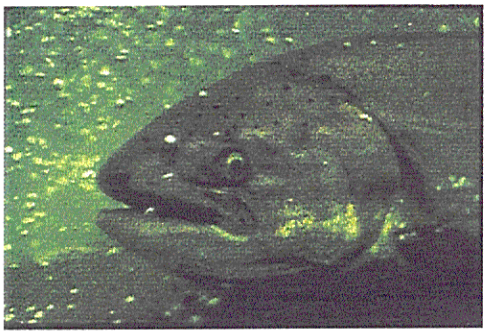
West Fork of Cow Creek Watershed Analysis Document



June 1997
Prepared by the Glendale R.A.
Ecosystem Analysis Team

May 27, 1997

West Fork Cow Creek

Ecosystem Analysis

Ver. 2.1

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West Fork Cow Creek
Ecosystem Analysis
Ver. 2.1

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Summary

The West Fork Cow Creek Ecosystem Analysis Area is a fifth field watershed of 55,842 acres, located in the KIamath Mountains province in southwest Oregon, approximately 20 miles northwest of the town of GIendale.

The area has a Mediterranean climate with an average annual precipitation of 60-90 inches. Extended summer drought is common. Elevations range from 1,000 feet to 4,000 feet above sea level. Topography is rugged and highly dissected with steep narrow canyons, with slopes averaging 55 percent.

The southern portion of the area is solid block ownership within the BLM Medford District, while the northern portion has federal lands intermingled with private lands in a "checkerboard" pattern. Approximately one half of the watershed is federally owned, the other half is privately owned. There are no known residences within the watershed.

The Medford District Resource Management Plan (RMP) designated several land use allocations for federal lands within the watershed.

Table S-1. Federal Land Use Allocations within the West Fork Cow Creek Watershed

Land Use Allocation	Acres (%)
BLM - Wilderness Area	147 (0)
BLM - Late-successional Reserves/1	3,850 (13)
BLM - Connectivity/Diversity Blocks	3,796 (13)
BLM - General Forest Mgmt. Area/2	17,475 (58)
BLM - Bobby Creek RNA	1,912 (6)
Forest Service - Wilderness Area	919 (3)
Forest Service (mostly Matrix)	1,836 (6)
Total	29,935 (99)

/1Late-successional reserves include portions of large LSR, marbled murrelet reserves and 100-acre spotted owl core areas

/2 General Forest Management Area includes Riparian Reserves

The West Fork Cow Creek watershed has been designated a Tier 1 Key Watershed in the RMP and is an integral part of the Aquatic Conservation Strategy.

There are 15,270 acres within the watershed which have been designated as critical habitat for the northern spotted owl, a federally listed Threatened species. The marbled murrelet reserves (2,284 acres) have been designated as critical habitat for that species.

The Wild Rogue Wilderness Area is managed by the Siskiyou National Forest.

The watershed was also identified as an Elk Management Area in the Medford District RMP.

There were seven Key Issues identified for this watershed:

Fish Habitat,
Habitat Conditions,
Elk Habitat,
Hydrologic Effects,
Human Use,
Roads, and
Forest Products.

The watershed has been greatly affected by timber harvest and associated road building. Most of the private lands have been logged, as well as many acres of BLM lands. The logging has adversely affected fish habitat, hydrologic functions and late-successional habitat. Fish streams are lacking in large down wood and shade, and are greatly affected by sedimentation. The hydrology of the watershed has been altered through compaction and ditching along roads. Logging has also removed and fragmented the older forest habitat.

The major forest product in the watershed is timber. In the past, the area has been too far from markets for other special forest products to be a big factor. Riparian reserves occupy about half of the General Forest Management Area acreage in the watershed. Other restrictions will reduce timber availability further. The Medford District, BLM growth and yield modeling indicates the watershed should produce about three million board feet annually. There are substantial questions about whether this level is sustainable given the management guidance for all resources.

The watershed has a high road density (approximately 4.5 miles per square mile) and many of the roads have aging culverts. The road system is the largest source of sediment into the streams.

Human use of the watershed has primarily been for hunting. There is a growing interest in using the area for cycling; the Glendale and Powers communities are actively promoting that concept. Conflicts between traditional users and new users may increase as the number of users and uses increase.

Elk forage does not appear to be a limiting factor in the watershed at this time, although it may be in the near future. High road densities are a larger concern for elk management. It appears that timber management and elk habitat are fairly compatible in this watershed.

An analysis of the interrelationships among the Key Issues indicated that the road system and the private lands have the greatest impacts on the watershed. Many of the recommendations for management of the watershed involved maintaining and improving the road system and developing partnerships with private land owners.

The long-term projection of the future conditions in the watershed was made using the present land use allocations, recommendations and natural processes.

Recommendations are presented for short-term management in the watershed in general, as well as for each individual Key Issue. The recommendations include monitoring and inventory needs, as well as active management proposals.

West Fork Cow Creek
Ecosystem Analysis

I. Introduction

The area covered under this ecosystem analysis was first analyzed in a preliminary watershed analysis document completed for the West Fork Cow Creek Watershed Analysis Area (WAA) in September 1994. The current analysis is designed to update information and analyses and insure conformance with the recent interagency guidance for ecosystem analysis.

This Ecosystem Analysis is designed to characterize the physical and biological elements, processes, and interactions within the watershed. It is not a decision-making document, but serves to set the stage for future decisions by providing a context in which plans and projects can be developed while considering all important issues within the watershed.

The format for the Ecosystem Analysis follows the format in Ecosystem Analysis at the Watershed Scale, Federal Guide for Watershed Analysis; August 1995. The process for conducting ecosystem analysis at the watershed scale has six steps:

(1) Characterization of the Watershed, in which the physical setting and the land allocations and designations are described;
(2) Identification of Issues and Key Questions, which define the scope and level of detail of the analysis;
(3) Description of Current Conditions within the watershed;
(4) Description of Reference Conditions, or historic conditions and trends;
(5) Synthesis and Interpretation of Information; and
(6) Recommendations.

This analysis is organized around this format, with a few modifications. The Current Conditions and Reference Conditions are combined into one chapter. The Key Issues and Key Questions are listed in Appendix B. The chapters are based on the Key Issues identified. However, overlap does occur among sections.

The first part of this analysis will address the physical, biological, and human processes or features of the watershed which affect ecosystem functions or conditions. Secondly, the Current and Reference Conditions of these important functions are described; followed by Synthesis and Interpretation, which is the comparison of these conditions and their significant differences, similarities, or trends and their causes. Finally, recommendations are made to guide the management of the watershed toward the desired future condition.

An interdisciplinary team developed the analysis utilizing direction in the Northwest Forest Plan dated April 13, 1994 and the Medford District Resource Management Plan (RMP) dated April 14, 1994. Resource-specific objectives and constraints common to all lands were used in planning management actions within this watershed.

There were seven Key Issues identified for this watershed:

Fish Habitat: How can management maintain or improve fish habitat, especially since this watershed was designated as a Tier 1 Key Watershed and provides habitat for the federally endangered Umpqua cutthroat trout?

Habitat Conditions: Past timber harvest has fragmented late-successional habitat and has reduced connectivity for species associated with older forests.

Elk Habitat: How can management improve elk habitat; particularly by improving forage conditions and reducing poaching and harassment?

Hydrologic Effects: Hydrologic parameters, such as compacted area, equivalent clear-cut area, transient snow zone openings and road density, have greatly altered the hydrology of the watershed.

Human Use: How can recreational and other use of the watershed be managed to benefit the public?

Roads: How can the current high density of roads be managed to maintain adequate access to public and private lands and still protect the watershed?

Forest Products: How should the forest products in the watershed be managed and still maintain other values?

II. Characterization

The West Fork Cow Creek watershed is located in the Umpqua River drainage in the KIamath Mountains province in southwest Oregon, approximately 20 miles northwest of the town of GIendale. This fifth field watershed is approximately 55,842 acres and encompasses all drainages of West Fork Cow Creek to its confluence with Cow Creek (Map 1).

Major tributaries include Wilson, Gold Mountain, Elk Valley, Bobby, Panther, Wallace, Stanley, and Bear Creeks (Map 2). The watershed has 4 sixth-field watersheds and 22 seventh-field watersheds ranging in size from 600 acres to 6,000 acres, including a series of small frontal streams which drain directly into West Fork Cow Creek.

The West Fork Cow Creek watershed is located within the Klamath geomorphic province and is characterized by a mixture of sedimentary, metasedimentary and ultramafic rock types. For a more detailed characterization of the geology, refer to files in the Medford BLM office.

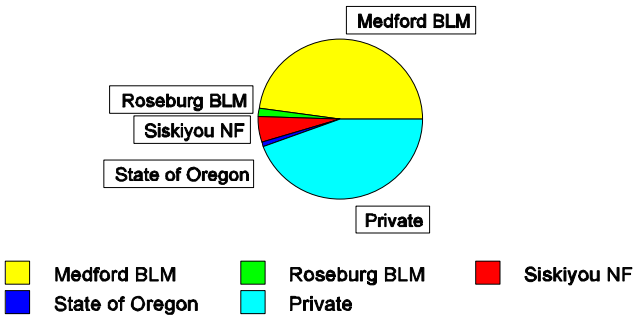
The area has a Mediterranean climate with an average annual precipitation of 60-90 inches. Extended summer drought is common. Elevations range from 1,000 feet to 4,000 feet above sea level. Topography is rugged and highly dissected with steep narrow canyons, with slopes averaging 55 percent.

The southern portion of the area is solid block ownership within the BLM Medford District, while the northern portion has federal lands intermingled with private lands in a "checkerboard" pattern characteristic of much of the Oregon and California (O&C) railroad lands of western Oregon (Map 3, Table 1 and Figure 1). Approximately one half of the watershed is federally owned, the other half is privately owned. There are no known residences within the watershed.

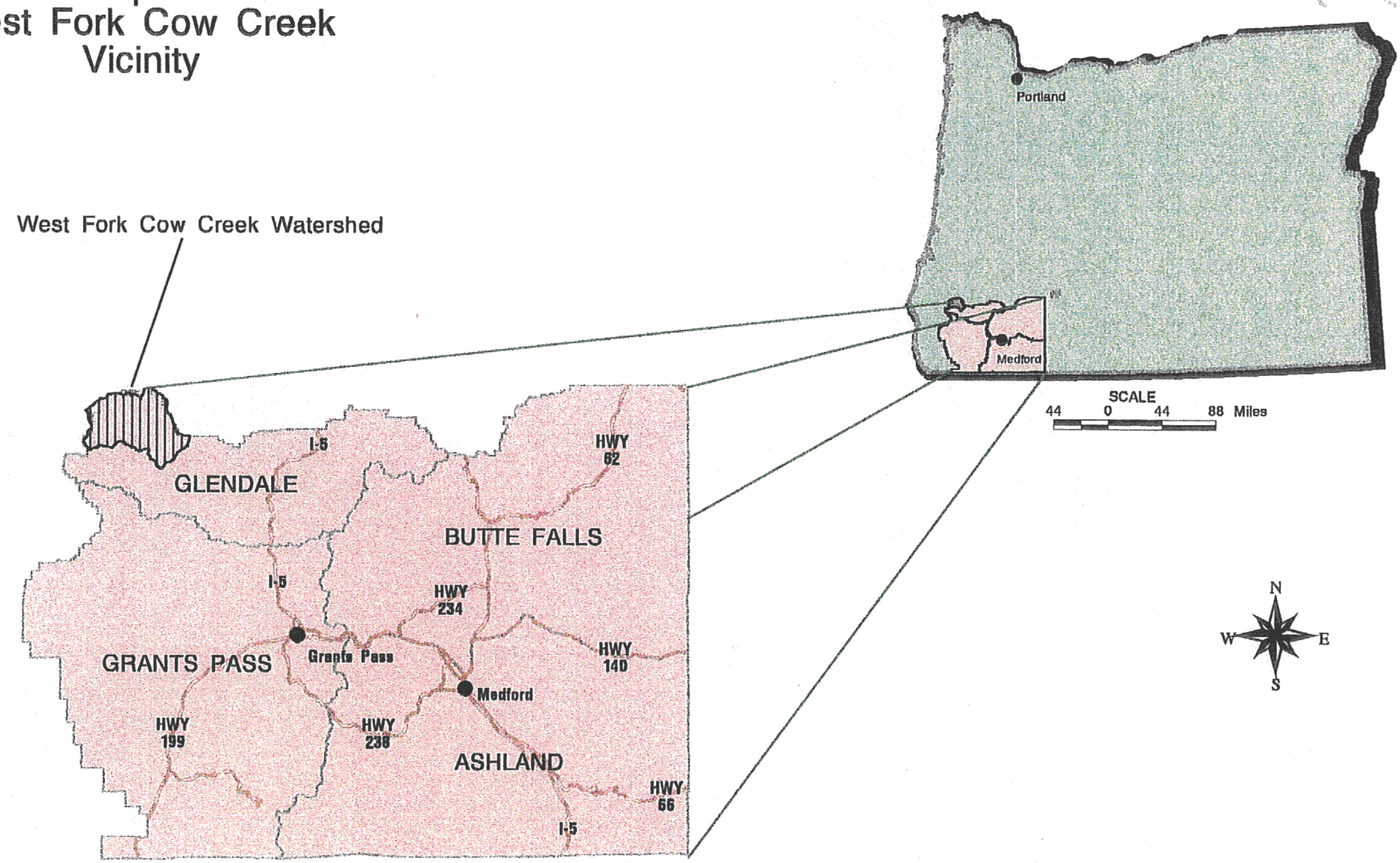
Table 1. Land Ownership - West Fork Cow Creek Watershed

Land Owner	Acres (percent)
Medford BLM	26,452 (47)
Roseburg BLM	728 (1)
Siskiyou NF	2,755 (5)
State of Oregon	625 (1)
Private	25,282 (45)
Total	55,842 (99)

Figure 1. Land Ownership
West Fork Cow Creek Watershed



Map 1.
West Fork Cow Creek Vicinity



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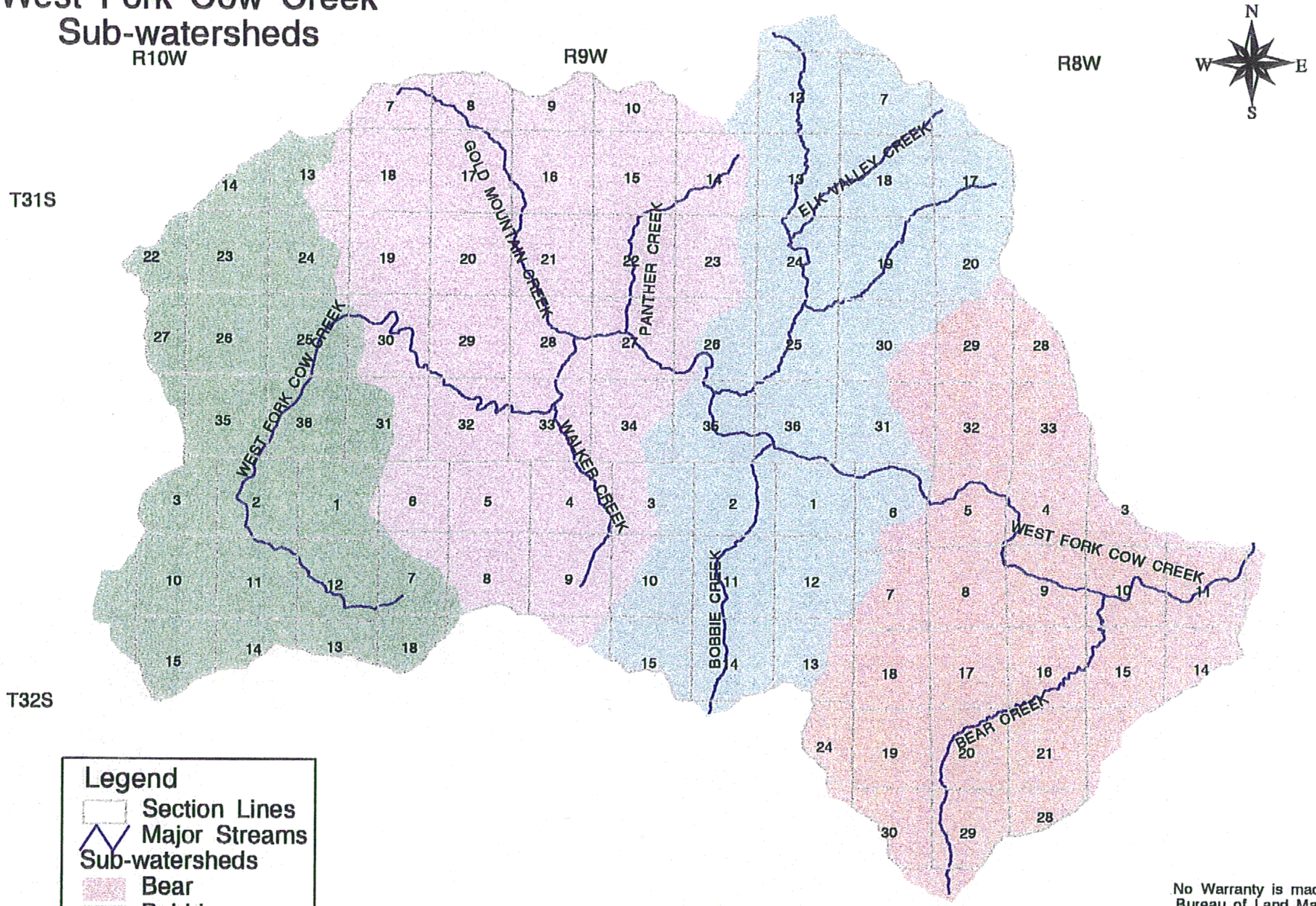
R. PIERLE, 11/20/96

Map 2.
West Fork Cow Creek
Sub-watersheds



Legend

- Section Lines
- Major Streams

Sub-watersheds

- Bear
- Bobbie
- Walker
- Wilson

2 0 SCALE 2 4 Miles

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R. PIERLE, 11/2196

The Medford District RMP designated several land use allocations for federal lands within the watershed (Map 4, Figure 2 and Table 2). These allocations provide overall management direction and varying levels of resource protection.

Table 2. Federal Land Use Allocations within the West Fork Cow Creek Watershed

Land Use Allocation	Acres (%)
BLM - Wilderness Area	147 (0)
BLM - Late-successional Reserves/1	3,850 (13)
BLM - Connectivity/Diversity Blocks	3,796 (13)
BLM - General Forest Mgmt. Area/2	17,475 (58)
BLM - Bobby Creek RNA	1,912 (6)
Forest Service - Wilderness Area	919 (3)
Forest Service (mostly Matrix)	1,836 (6)
Total	29,935 (99)

/1Late-successional reserves include portions of large LSR, marbled murrelet reserves and 100-acre spotted owl core areas

/2 General Forest Management Area includes Riparian Reserves

Late-successional reserves are areas designated in the RMP where the major management objective is to maintain or promote late-successional habitat. In this watershed there are three small portions of a large LSR which is located to the north, three marbled murrelet reserves and nine 100-acre spotted owl core areas.

Connectivity/Diversity blocks are generally square mile sections in which at least 25-30 percent of each block will be maintained in late-successional conditions. They are designed to promote movement of late-successional species across the landscape and add richness and diversity to the land outside the LSRs.

The General Forest Management Area (GFMA) is the allocation where timber harvest is a primary objective. On BLM lands, the GFMA and the connectivity/diversity blocks combined make up the “Matrix” lands in the Northwest Forest Plan.

Within the General Forest Management Area lands, there are 1,124 acres (5 percent) which have been withdrawn from intensive timber harvest. The majority of these acres were withdrawn due to rocky soils which preclude successful replanting.

The Bobby Creek drainage was identified in the RMP as an Area of Critical Environmental Concern (ACEC), with a large block of unentered old growth as its primary resource value. It contains 1,562 acres of contiguous habitat for species associated with late-successional habitat. Since then it has also been reviewed and accepted as a Research Natural Area (RNA), which is designed to provide areas where natural systems and processes are maintained. A separate management plan for the Bobby Creek RNA is being prepared.

In addition to these land allocations, there are also several other important designations that occur within the watershed.

The West Fork Cow Creek watershed has been designated a Tier 1 Key Watershed in the RMP and is an integral part of the Aquatic Conservation Strategy. Key watersheds are areas identified as being crucial for maintenance and recovery of habitat for "at- risk" stocks of anadromous salmonids and resident fish species. These refugia include areas of good, as well as degraded habitat. Areas in good condition will serve as anchors for the potential recovery of depressed stocks. Areas with lower quality habitat but with potential for restoration will become future sources of good habitat upon implementation of a comprehensive watershed restoration program.

There are 15,270 acres within the watershed which have been designated as critical habitat for the northern spotted owl, a federally-listed threatened species. The primary purpose of the critical habitat unit (CHU) is to help provide east-west dispersal of owls between the Klamath and Coast Range provinces and the Cascade Mountain province.

The Wild Rogue Wilderness Area is designated as Visual Resource Management (VRM) Class I, which means that management activities should not alter the natural appearance of the land. The rest of the watershed is VRM Class IV, which does not restrict management activities.

The watershed was also identified as an Elk Management Area in the Medford District RMP.

Map3.
West Fork Cow Creek Ownership

R10W R9W R8W

T31S T32S

N W E S

PANTHER CK RD
ELK VALLEY
WALKER PRAIRIE RD
W FORK COW CK
POWERS ROAD
BOBBY CK ACCESS
KELSEY MULE
DUTCH HENRY

Legend

Major Roads
Section Lines

Ownership
- Forest Service
- Private
- BLM O&C
- BLM Public Domain
- Sate of Oregon

2.3 0 SCALE 2.3 4.6 Miles

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R. PIERLE, 11/20/98

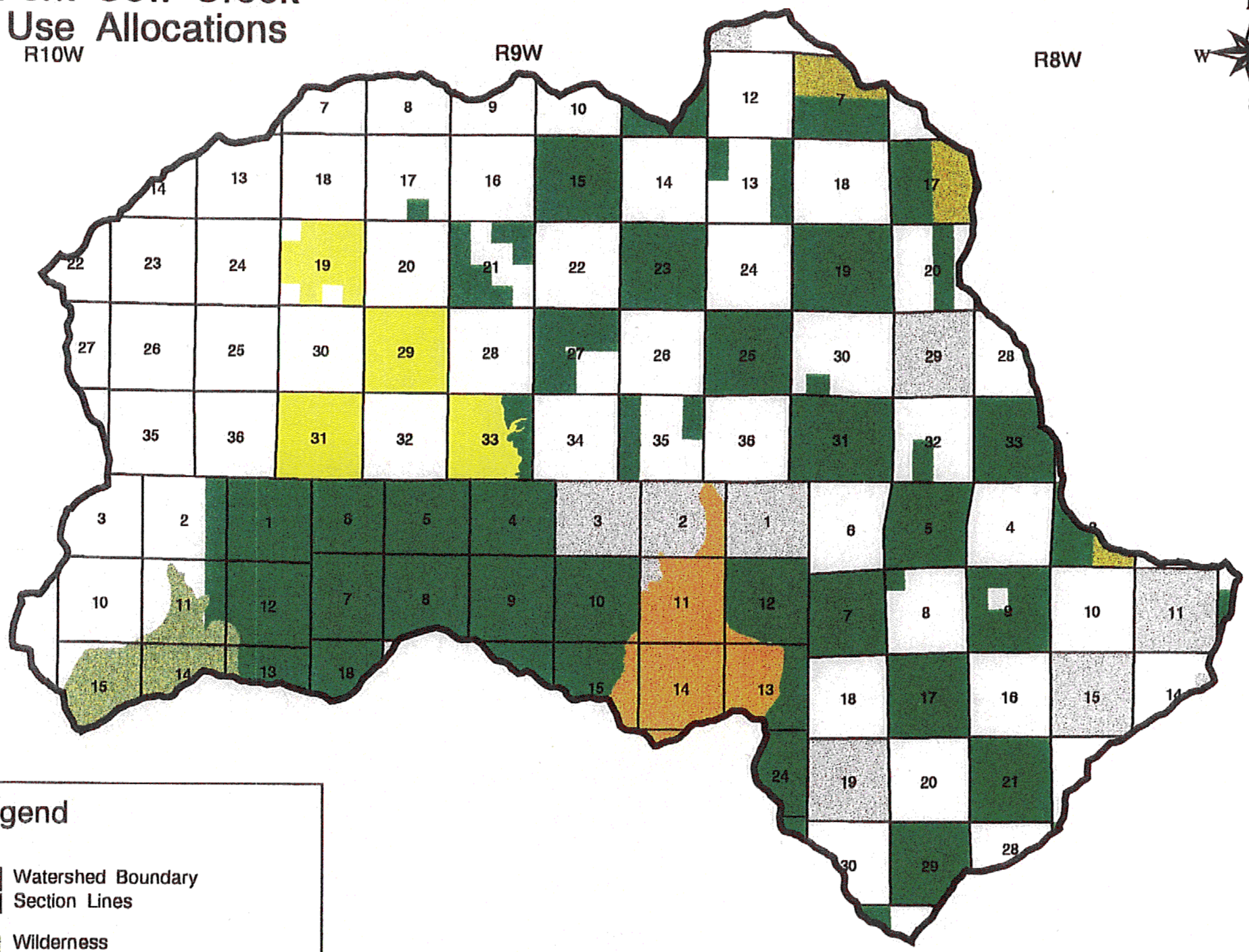
Map 4.
West Fork Cow Creek
Land Use Allocations

R10W R9W R8W

T31S

T32S

N W E S



Legend

- Watershed Boundary
- Section Lines
- Wilderness
- Connectivity
- General Forest Management Area
- Late Successional Reserves
- Marbled Murrelet Reserves
- Research Natural Area

2.2 0 SCALE 2.2 4.4 Miles

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R. PIERLE, 11/20/96

III. Current Conditions and Reference Conditions

Fish Habitat

The West Fork Cow Creek watershed provides habitat for coho and chinook salmon, and cutthroat and steelhead trout. Introduced rainbow trout are also found, but are not numerous or widespread.

The Umpqua River basin cutthroat trout has been listed as an endangered species under the Endangered Species Act. The National Marine Fisheries Service has proposed listing coho salmon and steelhead trout as threatened species.

Figure 2 and Table 3 show the miles of stream known to support these species. Map 5 illustrates the distribution of fish in the watershed. All streams with potential for fish habitat are inhabited by fish.

Non-game species such as speckled dace, Pacific lamprey, sculpin, and redside shiner also inhabit streams in the watershed. No streams in the watershed are stocked with hatchery fish. Analysis from scales from Coho salmon spawners by the Oregon Department of Fish and Wildlife (ODFW) indicates that hatchery fish do not spawn in the watershed. This is probably also true for winter-run steelhead.

Because neither the ODFW or BLM have historic data to compare to current information on fish populations and invertebrates in the West Fork watershed, there is no documented population trend. However, anecdotal information from old timers on Quines and Fortune Branch creeks in the Middle Cow watershed strongly suggest that salmon and steelhead populations in the West Fork Cow Creek were much higher 30 to 40 years ago than they are now.

All of the fish streams in the watershed were surveyed in 1993-1995 using the ODFW technique (ODFW 1996). Non-fisheries streams and riparian zones were also surveyed in 1994-1995 for information on proper functioning condition (Resource Area files).

Figure 2. Fish Habitat

West Fork Cow Creek Watershed

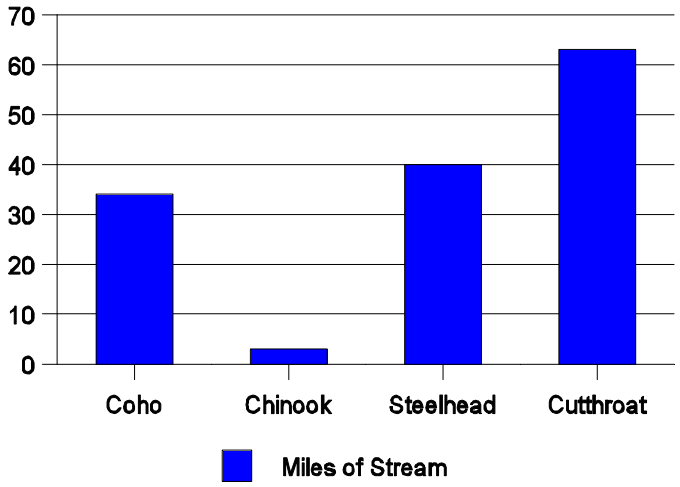


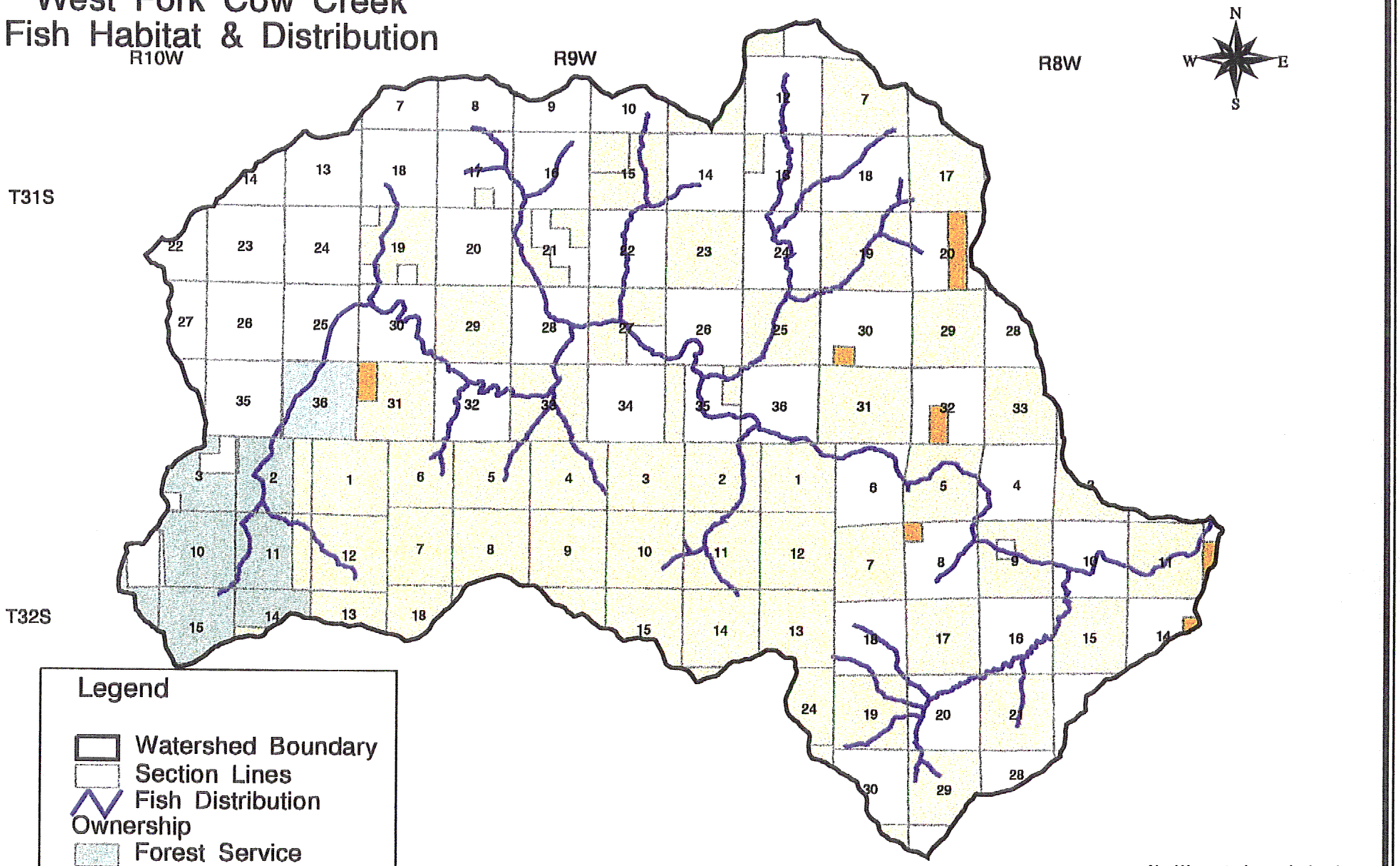
Table 3. Miles of fish streams within the West Fork Cow Creek watershed.

Stream	Coho	Chinook	Steelhead	Cutthroat Trout
West Fork Cow Creek	17.5	3.4	18.9	20.7
Bear Creek	2.8	-	5.2	10.1
Goat Trail Creek	0.3	-	0.5	0.8
Soldier Creek	0.2	-	0.2	0.4
Bobby Creek	0.3	-	0.3	3.6
Elk Valley Creek	7.2	-	8.3	11.1
Panther Creek	1.2	-	1.2	3.9
Gold Mountain Creek	1.5	-	1.5	4.4
Walker Creek	1.1	-	1.1	1.7
Wallace Creek	0.3	-	0.3	0.9
Slide Creek	1.2	-	1.2	2.2
Stanley Creek	0.9	-	1.5	1.8
Wilson Creek	-	-	-	1.8
Total	34.5	3.4	40.2	63.4

Use of the Klamath/Siskiyou Mountains Matrix of factors and indicators to evaluate stream, riparian and watershed condition (Appendix C) suggests that virtually all fish habitat in the watershed is in fair or good condition. The matrix was developed by a team of U.S. Forest Service and BLM biologists and hydrologists for use in formal consultation with the National Marine Fisheries Service (NMFS). Of the 14 fish bearing streams, five were judged to be in "Proper Functioning Conditions" and 9 were considered "Functioning - At Risk". None was considered to be "Not Properly Functioning." Primary factors causing reduction in habitat quality are timber harvest and roads.

Bobby, Walker, Wallace, Slide and Wilson Creeks currently provide the best salmonid habitat in the watershed (see Figures 3 and 4; Appendix C). This habitat represents about 16 percent of all salmonid habitat in the watershed. Stream reaches in good condition are generally dominated by mature and old growth forest but some, like lower Slide Creek, are on cut-over private lands. Habitat conditions in this case are expected to decline over time, if second growth conifers near these streams are not retained during future timber harvests.

Map 5.
West Fork Cow Creek
Fish Habitat & Distribution



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Fish habitat judged to be in the poorest condition includes the main stem West Fork Cow Creek, main stem and West Fork Elk Valley Creek, most of Bear Creek and Stanley Creek. Bjorn and Reiser (1991) provide an excellent discussion on salmonid habitat requirements.

The three major factors affecting fish habitat in the West Fork Cow Creek are sedimentation, water temperature and large woody debris.

Sedimentation

Soil erosion from roads (including tractor skid trails) and naturally unstable areas, as well as past and current timber harvest near streams are the major sources of habitat degradation in the West Fork Cow Creek watershed (see Figure 4). In this watershed, factors such as placer mining, water diversion, and conversion of forest land to agricultural use are not significant.

Water Temperature

Water temperature is one of the most important environmental variables which control habitat suitability for salmonids. The optimum temperature range for salmonid growth is between 55 and 60 degrees Fahrenheit; water temperatures over 64 degrees are considered a threat to salmonid health.

Water temperatures at 7 of the 14 locations and in 5 of the 9 streams which have been monitored since 1993 fail to meet the state water quality standards. Those standards call for maintaining the average maximum below 64 degrees Fahrenheit over any seven consecutive days.

Temperatures of all streams in the watershed, with the possible exception of West Fork Cow Creek, probably remained below 64 degrees during summer months before logging commenced in the 1950s. This is because stream channel widths on all West Fork tributaries appear to be narrow enough for stream side vegetation to provide adequate shade.

Large Woody Debris

Two to three “key” pieces of large woody debris per 100 meters of stream is considered adequate for fish production and properly functioning streams in the Klamath province. (ODFW 1996). A key piece of large woody debris is defined as larger than 0.6m x10m. Virtually all surveyed fish-bearing streams in the watershed are far below this standard (Figure 5).

Bobby Creek has been less affected from logging than any other fishery stream in the West Fork Cow Creek watershed. Riparian buffer strips at least 100 feet wide that did not include timber harvest have been retained next to timber sale units. Yet the concentration of LWD (l.4 to 1.7 key pieces per 100m) is less than what is considered optimum for fish habitat.

However, the density of large conifers along the stream suggests that the "desired" amount is a realistic goal.

The current amount of large woody debris (LWD) in Slide Creek is abundant, but is the residue from indiscriminate logging in the past.

In general, the best aquatic habitat (not necessarily fish habitat) is where there has been little or no timber harvest and road construction. As might be expected, unimpacted sub-watersheds are limited in size (many no greater than third order), and are located in larger blocks of late seral vegetation.

Aquatic macroinvertebrate survey data which has been collected over the past several years suggest that there are no aquatic Survey and Manage species (aquatic snails) in the watershed. It is unknown if Survey and Manage species (aquatic snails) were present prior to commencement of timber harvest and road construction in the 1950s. However, these species are sensitive to increases in sediment and water temperature.

The only known campsites next to streams in the watershed are on Walker, Wilson and Elk Valley creeks and on the West Fork near Panther Creek. None of these sites is used intensively; impacts on riparian and aquatic resources are highly localized and insignificant on a watershed basis. There is soil compaction at campsites and some soil erosion and loss of riparian vegetation where trails are on stream banks. Although human waste in streams should be a priority concern when considering future developments, it is not currently believed to be a problem.

Figure 3. Sediment levels in streams within the West Fork Cow Creek watershed.

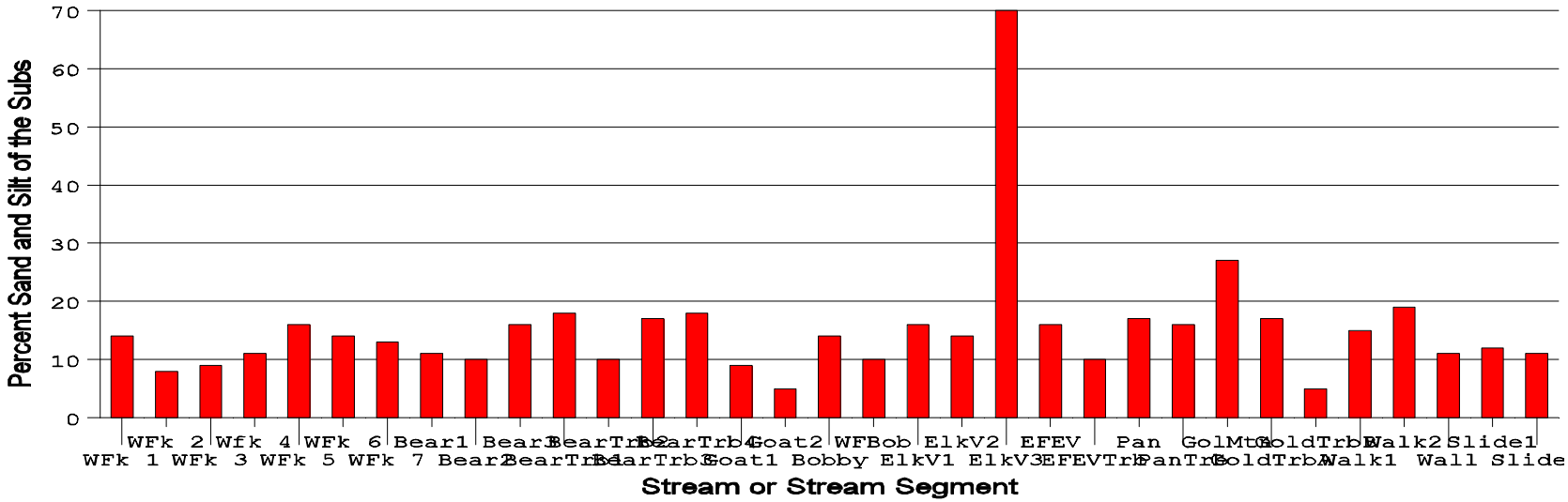
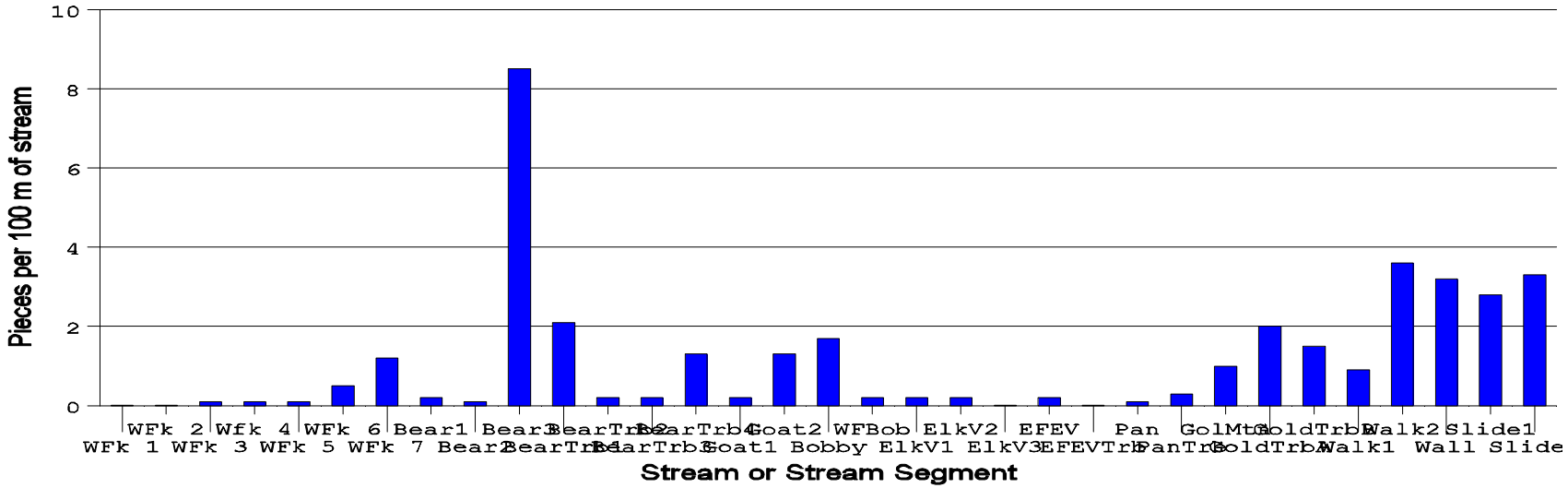


Figure 4. Large woody debris in streams within the West Fork Cow Creek watershed.



Habitat Conditions

Major Plant Groupings and Communities

There are two major plant groupings in the West Fork Cow Creek watershed: the Douglas-fir/tanoak-madrone grouping is the predominant grouping and the mixed conifer/madrone-deciduous brush/salal is a smaller component of the watershed. The plant groupings have been further refined with subgroups of the Douglas-fir/tanoak group and separate smaller inclusions of other minor associations. These plant groupings are shown on Map 6.

The Douglas-fir/tanoak-madrone grouping is characterized by an overstory of Douglas-fir with a minor component of sugar pine. This grouping is distributed throughout the central and eastern portions of the watershed on all aspects.

An association within the Douglas-fir/tanoak-madrone grouping is the Douglas-fir/tanoak/canyon live oak subgroup. These sites are characterized by an overstory of Douglas-fir with a secondary component of sugar pine, incense cedar and ponderosa pine. This subgroup dominates the southerly aspects and the shallow soils. The Bear Creek sub-watershed is dominated by this plant grouping.

Another area in the west central portion of the watershed occurs on soils derived from ultramafic rock. This subgroup of the Douglas-fir/tanoak-madrone grouping demonstrates a noticeable increase in sugar pine and a decrease in Douglas-fir in the overstory and Pacific rhododendron in the understory.

The mixed conifer/madrone-deciduous brush/salal grouping is characterized by an overstory of Douglas-fir and a minor component of sugar pine, white fir, western hemlock, incense cedar, western red cedar, and occasionally Port Orford cedar. This grouping occurs primarily on northerly aspects and along the higher elevations encompassing most of the western portion of the West Fork Cow Creek watershed.

In the western portion of the watershed near Stanley Creek is an inclusion of a true mixed conifer sub-grouping. It is dominated by an overstory of sugar pine, Douglas-fir, incense cedar, Port Orford cedar, western red cedar, and ponderosa pine.

On the northwest edge of the watershed, in the mixed conifer grouping, a sandstone ridge dominates the landscape. It extends from Elk Valley Creek in the east to Stanley Creek in the west. This area displays a vegetative community which is noticeably nutrient deficient. The vegetation is chlorotic and slow growing, particularly in areas where soils have been disturbed.

The white oak/savanna grouping is a small, but very distinct inclusion. This grouping occurs primarily in isolated small valleys and rocky flats with shallow soils on flat ridges. It is dominated in the overstory by white and black oak and occasionally ponderosa pine and Douglas-fir, with grass as the primary ground cover. The reduction in the occurrence of wildfire has allowed for the encroachment of young Douglas-fir and some ponderosa pine in the understory along with increases in wedgeleaf ceanothus and manzanita.

In each of these vegetation types, the early seral vegetation is somewhat different than the vegetation in the understory of a forest in a later seral stage. Varnishleaf ceanothus and deer brush ceanothus are often dominant early seral shrub species on all but the drier, rocky shallow soil sites such as in the serpentine, sandstone, and oak/savanna areas. Manzanita is an early seral species on the drier sites, such as the canyon live oak subgroup, along with canyon live oak.

Dry and wet meadows are important but small vegetation types in the watershed (Map 7). The most important meadows are those in the Elk Valley Creek drainage. In other places, such as Walker Prairie, the meadow conditions blend into an oak/pine savannah which is dominated by grass and forbs, with scattered large white oaks and ponderosa pines.

Other special habitat features such as rock outcrops, cliffs, caves and talus slopes occur throughout the watershed as scattered, small inclusions in the forest matrix.

One of the important aspects in considering the different plant groupings is the varying potential they have for supporting dense, old growth forests with a closed canopy overstory. The mixed conifer group and the Douglas-fir/tanoak group can support this type of forest. However, the areas that encompass the sandstone and serpentine soils, and the Douglas-fir/tanoak group with the subgroup of canon live oak, cannot support late seral/old growth characteristics. These areas are not capable of producing those closed canopy, old growth forest conditions due to shallow soils, rockiness, nutrient deficiency and droughtiness.

There is little quantitative information on the naturally occurring levels of coarse woody debris in the various plant groupings in this province. Limited surveys in the Elk Valley Creek and Bobby Creek sub-watersheds suggest that coarse woody debris levels are quite variable in the mixed conifer and Douglas fir/tanoak groups. However, in the canyon live oak sub-group surveys in four stands indicate reduced levels of coarse woody debris, particularly in the larger size classes (i.e. larger than 16 inch diameter). This supports observations that the plant communities which do not support old growth forest conditions likely do not have the levels of naturally occurring coarse woody debris specified in the RMP.

Map 6.
West Fork Cow Creek
Vegetative Series / Plant Communities

R10W R9W R8W

N W E S

T31S

T32S

Legend

- Section Lines

Plant Series / Communities

- Douglas-fir / Tanoak-Madrone
- Douglas-fir / Tanoak / Canyon Live Oak
- Douglas-fir / Tanoak / Sugar Pine
- Mixed Conifer / Madrone-Deciduous Brush/Salal
- Mixed Conifer
- Mixed Conifer- On Soil Limited Sites
- White Oak / Savanna

SCALE

2 0 2 4 Miles

No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completness of this data for individual use or aggregate use with other data.

R. PIERLE, 11/21/96

Disturbance Processes

The fire frequency for southern Oregon has been reported as from "less than 3 years to more than 50 years" and from "20 to 200 years" (Reforestation Practices in southern Oregon- 1992). A forest survey done in 1900 observed, "There is not a single forested township either on the west side or the east side of the range in which the timber isn't more or less fire marked" (Leiberg 1900). While it is not possible to determine the exact fire frequency it is likely that the drier, rockier sites, dominated by the Douglas-fir/tanoak/canyon live oak sub-group, had fire frequencies of less than 50 years. The higher rainfall areas in the western part of the watershed, in the mixed conifer and Douglas- fir/tanoak main groupings, likely had fire frequencies of at least 50 - 80 years, if not substantially longer.

The area was almost certainly characterized by a variety of fire intensities as well. There were probably frequent, low intensity ground fires which burned the understory vegetation in a patchy mosaic pattern but retained the overstory forest. Large scale, stand replacement fires did occur, resulting in large, even age forests. But even these were patchy in nature, retaining islands of unburned stands.

The effect of several decades of fire suppression on timber and vegetation has been the encroachment of trees on areas that previously were more open, grassland areas and rockier, harsher sites. The shrub component has also increased in areas where the conifer overstory naturally provides incomplete canopy closure due to site conditions. Also, natural conifer regeneration growing under limited light conditions under a mature overstory is more dense and exists longer without periodic fire which reduces its density. This is more likely in the rockier, drier areas that are prone to more frequent fires.

Overall, the forested areas in the watershed are slowly expanding and the competition from undergrowth (including conifers, shrubs and hardwoods) is increasing. This translates to an increased competition for water and possibly essential nutrients between the overstory and the understory and reduced growth for both. This will likely be more pronounced on the harsher sites with more frequent fires where fire exclusion has had a greater effect.

Diseases play a relatively small role as a disturbance agent in this watershed. The primary diseases know to occur are Port Orford Cedar root rot (*Phytophthora lateralis*) and blackstain root disease (*Leptographium wageneri*). Known distributions of these diseases are shown on Map 8.

The Medford District has a management plan for all operations occurring within the distribution area of Port-Orford cedar which includes mitigating measures to reduce the chance of spreading the Port Orford cedar root rot. The plan is available for review at the district office. The district is presently in the process of mapping the distribution of the cedar and the root disease, but the disease is widely distributed among populations of cedar. This is an important disease because it is spread easily, causes a high mortality, and has a large effect on any timber operations occurring within its range.

Black stain root disease generally infects plantations less than 30-40 years old. It affects primarily Douglas-fir in this watershed but is not as extensive as Port Orford cedar root rot and is more easily contained. It exists in plantations but only affects pockets in those plantations. Its spread through root grafts is slow, while the adjacent stands grow out of their high susceptibility stage. The spread by insects, which is faster, can be controlled through proper timing of silvicultural activities.

Windthrow is a minor problem in this watershed. However, the problem has increased in some high wind areas, such as ridges, due to timber harvest. In this area, windthrow is usually restricted to individual trees or very small patches less than ½ acre. Wind has occasionally had a large impact, such as in 1962, when hurricane force winds hit much of the state. In this watershed, the Walker Creek drainage sustained extensive windthrow followed by large scale timber salvage operations.

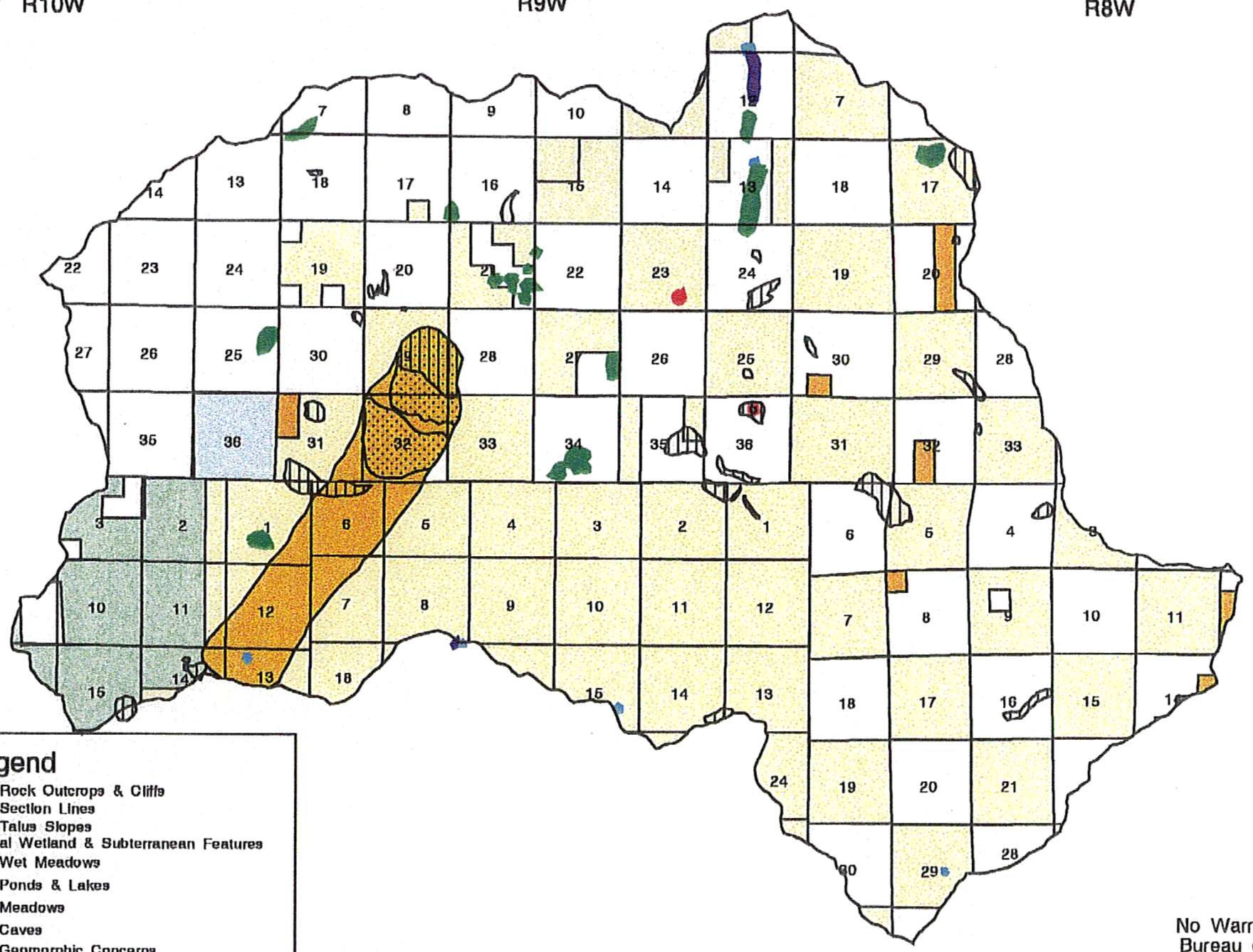
Noxious weeds, though not a major disturbance at this time, are spread throughout the entire watershed, as opposed to being concentrated in certain areas. The one exception is Scotch Broom, which at the present time occurs along the West Fork Cow Creek and at other locations. Other species of concern include star thistle, knapweed and yellow sweet clover. It appears that road blading, associated with road maintenance, is the primary means of spreading the weeds.

Map 7.
West Fork Cow Creek
Special Habitat Features

R10W R9W R8W

T31S

T32S



Legend

- Rock Outcrops & Cliffs
- Section Lines
- Talus Slopes

Special Wetland & Subterranean Features

- Wet Meadows
- Ponds & Lakes
- Meadows
- Caves
- Geomorphic Concerns

Ownership

- Forest Service
- Private
- O&C
- Public Domain
- Sate of Oregon

2 0 SCALE 2 4 Miles

No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completness of this data for individual use or aggregate use with other data.

R. PIERLE, 11/21/96

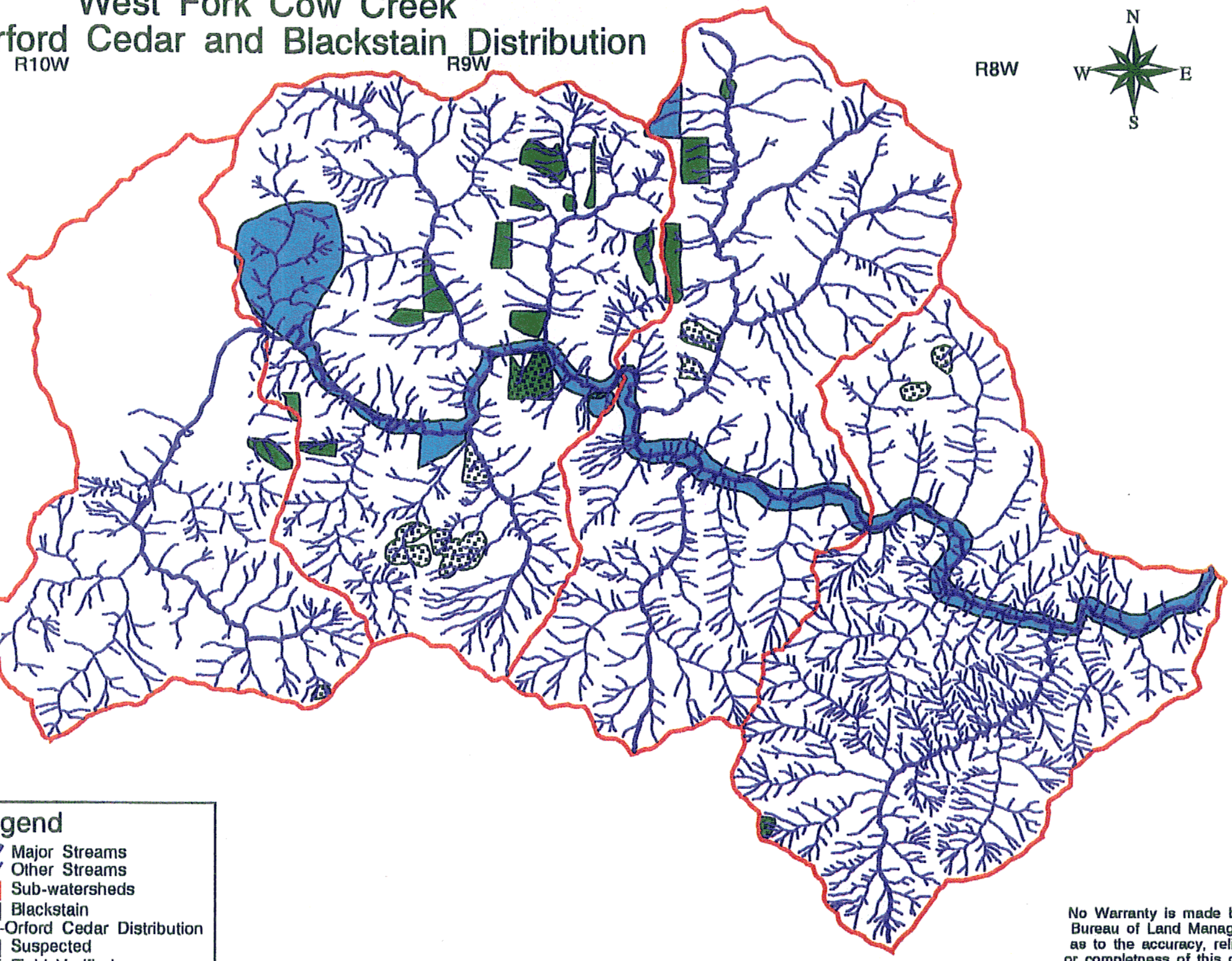
Map 8.
West Fork Cow Creek
Port-Orford Cedar and Blackstain Distribution

R10W R9W R8W

N W E S

T31S

T32S



Legend

- Major Streams
- Other Streams
- Sub-watersheds
- Blackstain

Port-Orford Cedar Distribution

- Suspected
- Field Varified

1.9 0 SCALE 1.9 3.8 Miles

No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completness of this data for individual use or aggregate use with other data.

R. PIERLE, 11/21/96

Seral Stages - Historic and Current Conditions

Historically this watershed was primarily a forested area. Aerial photos taken in 1953, prior to any major timber harvest on BLM land, show an extensively forested landscape. The photos do show that areas in the Bear Creek drainage, and on serpentine soil areas in Wilson Creek, had relatively sparse tree cover. The ridges in the Bear Creek drainage were particularly lacking in tree cover. The area also shows a history of fire activity with a very large fire from the 1940s in the Panther Creek vicinity.

Effective fire suppression in the watershed began around 1900, which would have had an influence on the landscape as compared to pre-settlement times. Encroachment by trees on previously burned openings would have begun and understory vegetation and conifer regeneration would have become established in smaller forest openings and areas of lighter over story. The acreage of mature and late seral forest was greater than at present due primarily to timber harvest since the 1960s. The acreage of young forest and shrub vegetation was smaller than at present due to the change in fire frequency and more recent harvest and reforestation practices (Table 4).

The map showing the historic vegetation distribution was developed from the 1953 photos (Map 9). The areas depicted as late seral forest - light over story are in that condition due to naturally occurring environmental conditions, particularly shallow, rocky, droughty or low nutrient soils. These areas coincide with the present day vegetation communities that exist on the sandstone and serpentine areas and with the subgroup of the Douglas-fir/tanoak grouping that is dominated by canyon live oak which occurs on rocky shallow, soils and often on south aspects.

The areas described as later seral forest - heavy overstory, which includes most of the watershed, coincides with the rest of the Douglas-fir/tanoak grouping and the mixed conifer/deciduous brush-madrone/salal grouping. The young stands (30-80 years) are the result of a natural disturbance, usually fire and possibly wind storms. Table 4 compares age classes in the watershed past and present, however the present "modified 80-200 year old" stands are not similar to the "historic light over story" stands. The present modified stands are the result of past partial cutting in heavy over story stands and the historic light over story stands are not capable of supporting a heavy over story due to the environmental conditions mentioned earlier.

More detailed and accurate information is available on the current distribution of seral stages in the watershed, particularly for BLM administered lands. This information is summarized in Table 5 and on Map 10. The data for BLM lands is derived from the Operations Inventory data, which is based on field examination. The information for non-BLM lands was gathered using 1991 and 1996 aerial photos.

More detailed and accurate information is available on the current distribution of seral stages in the watershed, particularly for BLM administered lands. This information is summarized in Table 5 and on Map 10. The data for BLM lands is derived from the Operations Inventory data, which is based on field examination. The information for non-BLM lands was gathered using 1991 and 1996 aerial photos.

The current seral stage distribution on BLM lands has direct implications for timber production as well as for management for wildlife, especially those species associated with older forest conditions. The distribution of seral stages among the land use allocations is important; older forests are available for timber harvest only where they occur on GFMA lands. Conversely, older forests will provide long-term habitat for late-successional species only on lands designated as some type of reserve. The seral stage distribution among allocations is summarized in Table 6.

For the analysis of this watershed, the definition of the term “late-successional” forest follows that in the Record of Decision for the Northwest Forest Plan and in the Medford District RMP. Late-successional forests include mature and old-growth forests. Stands which were at least 80 years old, and which had not been substantially modified by prior timber harvest, were included in the late-successional category. In this watershed stands begin to slow their growth at about 80 years old.

There is substantial variation within the watershed. On highly productive sites, stands 150-200 years old often have the open, undifferentiated structure of mature stands, while on lower sites, multi-layered canopies and snag creation occur at much younger ages. It is recognized that stands 80-150 years old often do not possess all the structural characteristics required for some species. These tend to be mature stands with closed canopies, single canopy layers and few snags. However, these stands often do support many species associated with old-growth forests to some degree.

A large majority of the late-successional habitat in the watershed occurs on BLM lands. It is expected that private timber lands will continue to be cut and are not expected to grow much older than 60 years. As a result, within a short time virtually all of this habitat will occur only on federal lands.

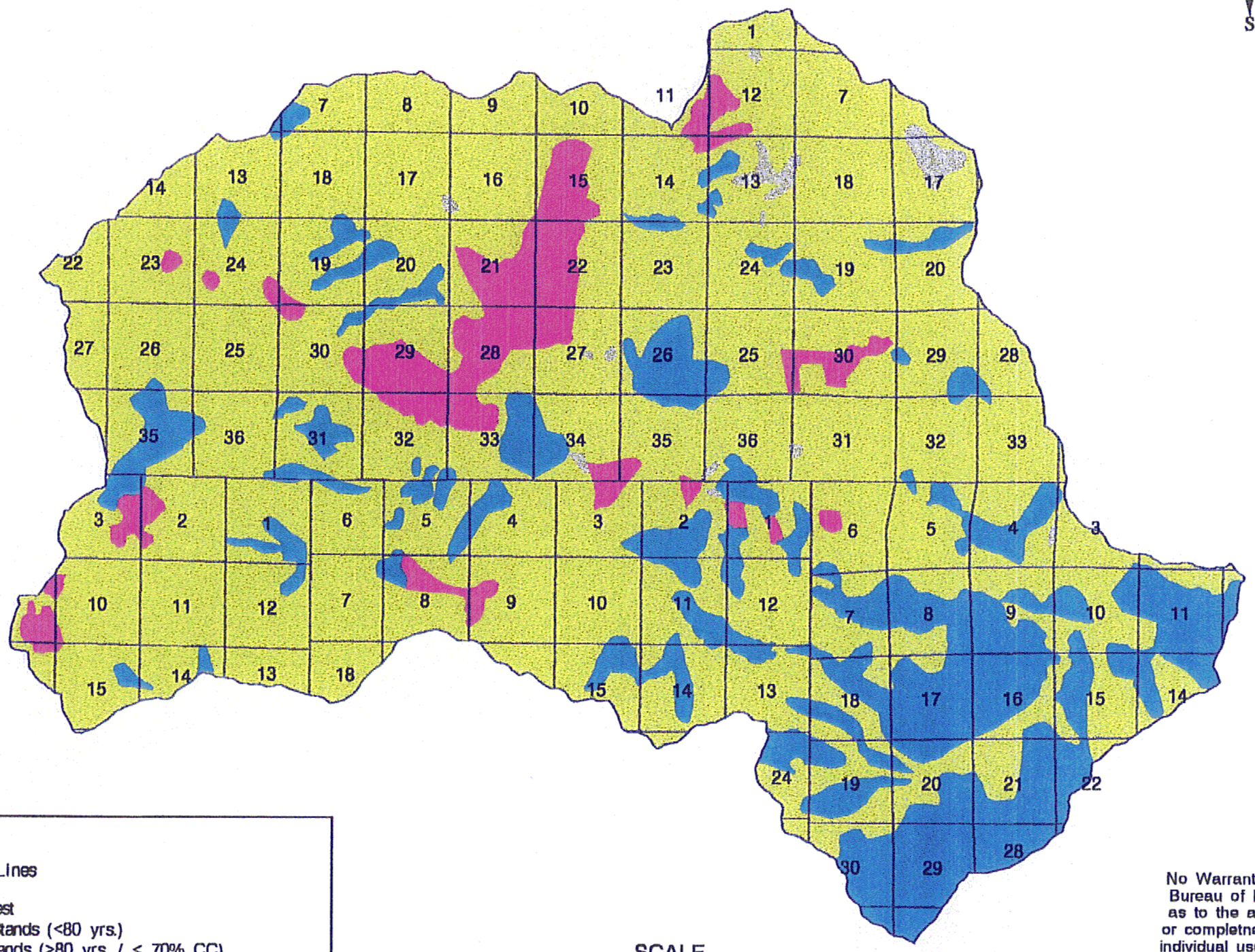
Map 9.
West Fork Cow Creek
1953 HistoricVegetation

R10W R9W R8W

N W E S

T31S

T32S



Legend

- Section Lines
- Non-Forest
- Young Stands (<80 yrs.)
- Older Stands (>80 yrs. / < 70% CC)
- Older Stands (>80 yrs. / > 70% CC)

SCALE

2 0 2 4 Miles

No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completness of this data for individual use or aggregate use with other data.

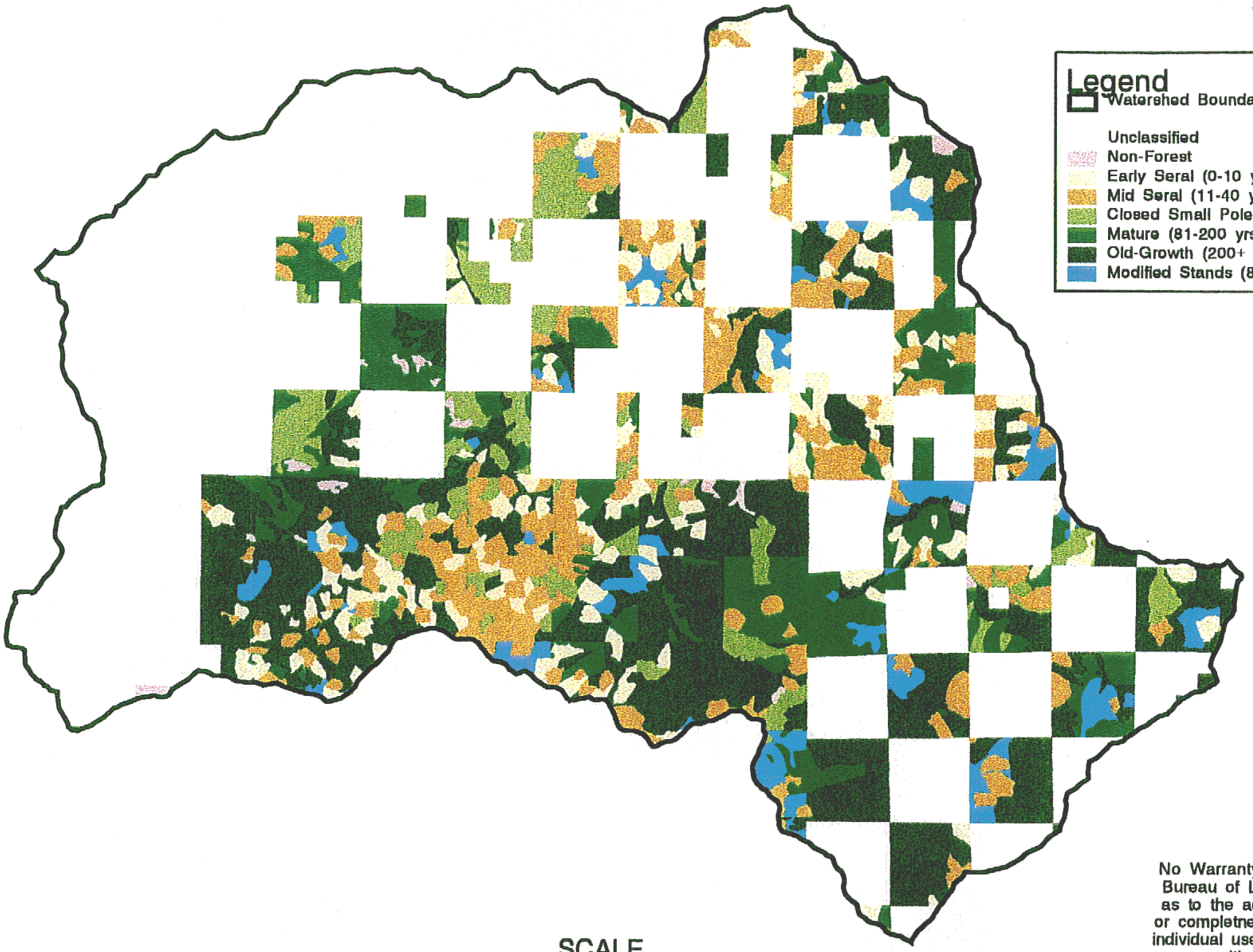
R. PIERLE, 11/21/96

Map 10.
West Fork Cow Creek
Seral Stages

R10W R9W R8W

T31S

T32S



N
W E
S

Legend

- Watershed Boundary
- Unclassified
- Non-Forest
- Early Seral (0-10 yrs.)
- Mid Seral (11-40 yrs.)
- Closed Small Poles (41-80yrs.)
- Mature (81-200 yrs.)
- Old-Growth (200+ yrs.)
- Modified Stands (81-200 yrs.)

SCALE

2 0 2 4 Miles

No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completness of this data for individual use or aggregate use with other data.

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Table 4. Estimated historic and current seral stages within the West Fork Cow Creek watershed.

	Historic Condition		Current Condition	
Age/Structure Class	Acres	Percent of Total	Acres	Percent of Total
Non-Forest	393	1	303	1
Young Forest (0-80 years)	3,400	6	35,851	64
Late Seral Forest 81+ years, Heavy overstory	41,495	74	17,965	32
Late Seral Forest 81+ years, Light overstory	10,555	19	1,717	3

Table 5. Seral stage distribution in the West Fork Cow Creek watershed, by ownership (acres/percent of total).

Age/Structure Class	BLM	US Forest Service	Private/State	Total
Non-forest	244	0	59	303
Early Seral (0-10 yrs)	3,386	58	3,442	6,886
Mid Seral (11-40 yrs)	4,748	677	17,942	23,367
Closed Poles (41-80 yrs)	2,534	0	3,064	5,598
Mature (81-200 yrs)	4,471	2,019	1,399	7,889
Old Growth (200+yrs)	10,076	0	0	10,076
Modified Older Stands (81+ yrs)	1,717	0	0	1,717

Total	27,176	2,754	25,906	55,836

Table 6. Acres of seral stages on BLM lands, by land use allocation, within the West Fork Cow Creek watershed.

Age/Structure Class	Wilderness	LSRs	Connectivity/Diversity Blocks	Research Natural Area	GFMA	Total
Non-forest	33	110	26	15	60	244
Early Seral (0-10 yrs)	0	173	391	107	2,715	3,386
Mid Seral (11-40 yrs)	0	211	564	79	3,894	4,748
Closed Poles (41-80)	0	770	193	145	1,426	2,534
Mature (81-200)	3	1,181	656	133	2,498	4,471
Old Growth (200+)	111	1,305	1,719	1,429	5,512	10,076
Modified Older Stands (81+ yrs)	0	98	248	4	1,367	1,717
Total	147	3,848	3,797	1,912	17,472	27,176

Late-Successional habitat characteristics

Historically, the late-successional habitat in the watershed probably occurred as a much more contiguous matrix on the landscape, with smaller inclusions of earlier seral stages and openings resulting from fire, wind storms, rocky soils or disease (Map 9). No doubt the exact locations and shapes of stands varied over time as these processes occurred, but it is likely that the essential character of the watershed as a forested environment, dominated by older stands, persisted.

Most old growth stands in the watershed are characterized by a closed canopy, but with widely spaced, large, old conifer trees (Franklin, et al. 1991). A large component of the overall canopy closure is comprised of lower layers of hardwoods and pole-size conifers between the larger conifers. Hardwoods are a smaller portion of the canopy in the mixed conifer type than they are in the Douglas fir/tanoak-madrone type.

The oldest trees tend to occur on rocky, talus slopes because there is less fuel buildup and less competition with brush and other vegetation for resources. Intense, conflagration fires occur less

frequently in these stands. The stands are thinned by themselves, resulting in low density, more pure Douglas fir stands. Deeper soils and more gradual slopes with better growing conditions actually have younger trees because of greater fire hazard and incidence, and greater competition with other vegetation. It is unlikely for trees within the watershed to grow older than 400 years old because of the harsh conditions and historic fire incidence.

Late-successional habitat within the watershed today is highly fragmented due to past harvest practices on public and private lands (Map 11). Virtually no late-successional habitat exists in Gold Mountain, Panther, and Elk Valley Creek drainages.

Moderately large, section-sized blocks of late-successional habitat occurs in the southeastern portion of the watershed, primarily in the Bear Creek drainage.

The two large blocks of late-successional habitat occur within the BLM block ownership areas in the southern portion of the watershed: Bobby/Sweat/No Sweat Creeks, and Wilson and Slide Creeks/Wilderness in the southwestern portion of the watershed. Late-successional habitat within the Bobby Creek block is fairly intact, and would remain intact in the RNA unless the land allocation changes. Late-successional habitat within the Wilson/Slide Creeks block is somewhat fragmented, and is currently allocated as northern GFMA lands, although a fairly extensive network of riparian reserves occurs within the block. Many very small patches of late-successional habitat are currently scattered throughout public lands in the watershed, but have no connectivity to the larger blocks of late-successional habitat.

Late-successional forest patch size and edge characteristics

Habitat edges within the watershed are generally very abrupt and distinct between stands which have been cut and those which have not. The resulting edge effect can extend 400-600 feet into a habitat patch (Chen, et al. 1995). Many small patches of late-successional stands in the northern portions of the watershed do not provide interior habitat conditions as a result of this edge effect, and thus are not considered effective late-successional habitat. High road density in the watershed increases fragmentation of late-successional habitat, particularly in small patches. Roads create barriers to movement for low mobility species.

Connectivity for species associated with late-successional habitat

The two major issues surrounding connectivity for species associated with late-successional habitat are how the watershed is linked to other watersheds and reserves outside the watershed and how blocks of older habitat within the watershed are connected to, or isolated from, each other.

The watershed is located in an area which has been identified as a regional area of concern for dispersal and gene flow east and west between the Coast Range province and the Cascades province. North of this band the Willamette Valley creates a substantial barrier and to the south the Rogue Valley is also a problem.

Species with high mobility, such as spotted or great gray owls, can move fairly long distances between isolated refugia of late-successional habitat. Species with low mobility, such as salamanders or red tree voles, are more restricted in their dispersal capability. These species require more continuous connectivity corridors to provide adequate gene flow. In this watershed, sufficient connectivity for these low mobility species is a primary concern.

Northeast to southwest connectivity for low mobility species between the northeastern LSR and Bobby Creek RNA is provided in the southeastern portion of the watershed, primarily by riparian reserves, connectivity blocks, and section-sized blocks of late-successional habitat on public lands (Map 11).

The closest Late Successional Reserves (LSRs) near this watershed are adjacent to the northeast boundary of the watershed (in the Roseburg BLM District) and approximately 2-3 miles to the southwest of the watershed in the Rogue Frontal North HUC-5 watershed (Map 11). Relative barriers to connectivity occur to the south in the Mule Creek watershed due to the fragmentation of the area. But some riparian reserves are intact, providing connectivity between the West Fork Cow Creek and Mule Creek watersheds.

Connectivity within the watershed is currently limited by habitat fragmentation, particularly in the northern half of the watershed with the checkerboard ownership pattern.

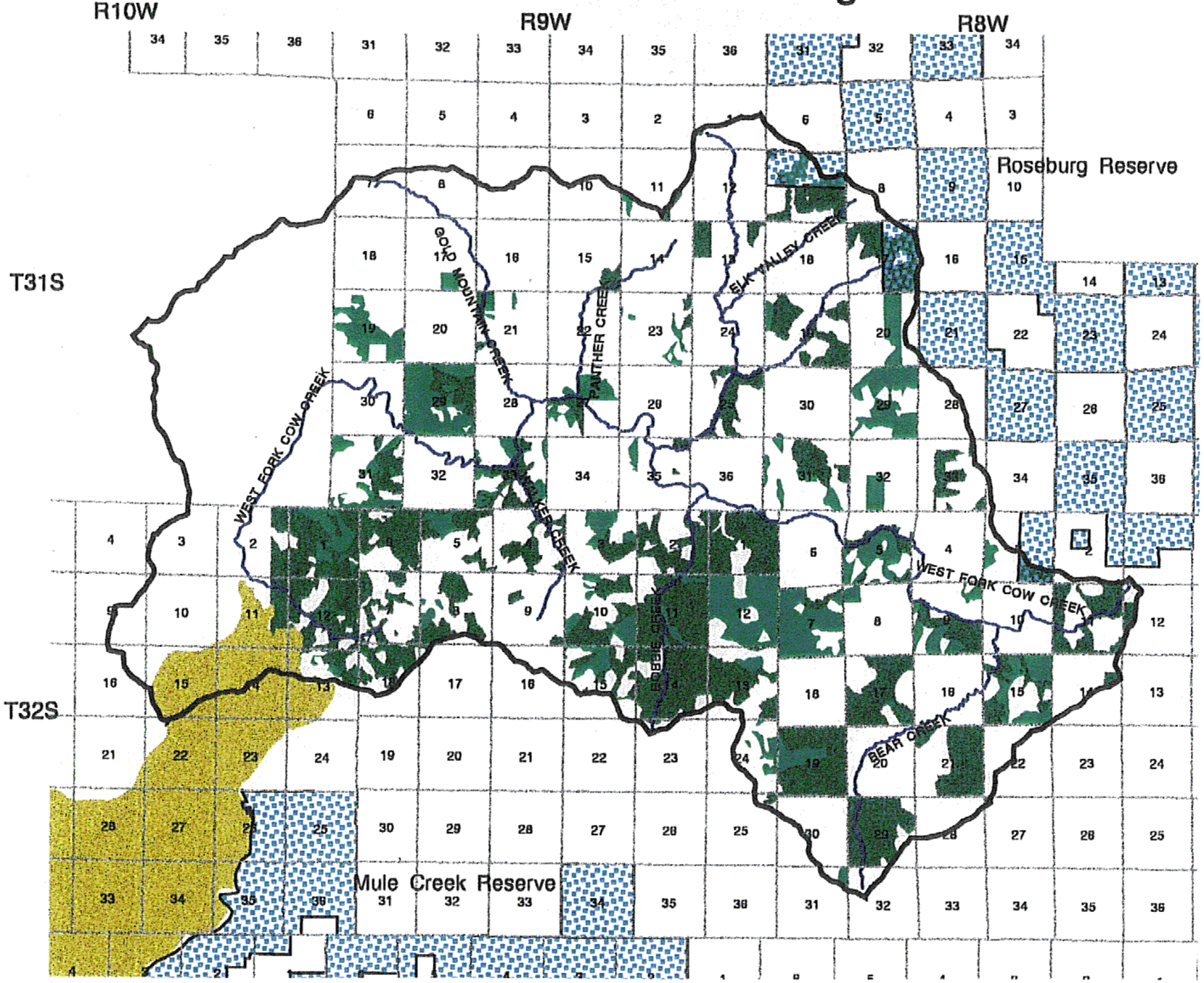
The land allocations which have the greatest potential to provide connectivity for late-successional species include connectivity/diversity blocks, marbled murrelet reserves, 100-acre spotted owl core areas, the Bobby Creek RNA, the

Wild Rogue Wilderness Area, and riparian reserves

Eight connectivity blocks occur within the watershed. Four are associated with the RNA, three are in the southwestern portion of the watershed, and one is in the northeastern portion of the watershed. There are no connectivity/diversity blocks in the north and northwest portion of the watershed. The four marbled murrelet reserves are located in the western portion of the watershed. The spotted owl core areas are distributed evenly throughout the watershed and are fairly isolated in themselves. The RNA and the wilderness area contain large blocks of habitat, but they are located at the edges of the watershed, in two discrete parcels. While all these allocations provide core reserve habitat patches or refugia adequate for dispersal of high mobility species, their value in connectivity is limited for species with low mobility. This leaves riparian reserves (Map 12) as having the greatest opportunity for contributing to late-successional habitat connectivity now and in the future.

Connectivity along riparian reserves is generally intact in the southeastern portion of the watershed, given the checkerboard ownership, but is in poor condition in the northern half of the watershed. The checkerboard ownership pattern throughout the watershed interrupts the continuity of riparian reserves, often providing connectivity only “corner-to-corner” between public land parcels (Map 12). Many of these riparian reserves are currently in early to mid seral stages. Stands within these reserves will require time to mature and function as envisioned under the Forest Plan and Medford District RMP.

Map 11.
West Fork Cow Creek
Late Successional Habitat and Surrounding Reserves



Legend

- Watershed Boundary
- Section Lines
- Lua
- Wilderness
- Major Streams
- Mature (81-200 yrs.)
- Old-Growth (200+ yrs.)

2 0 SCALE 4 6 Miles

No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completness of this data for individual use or aggregate use with other data.

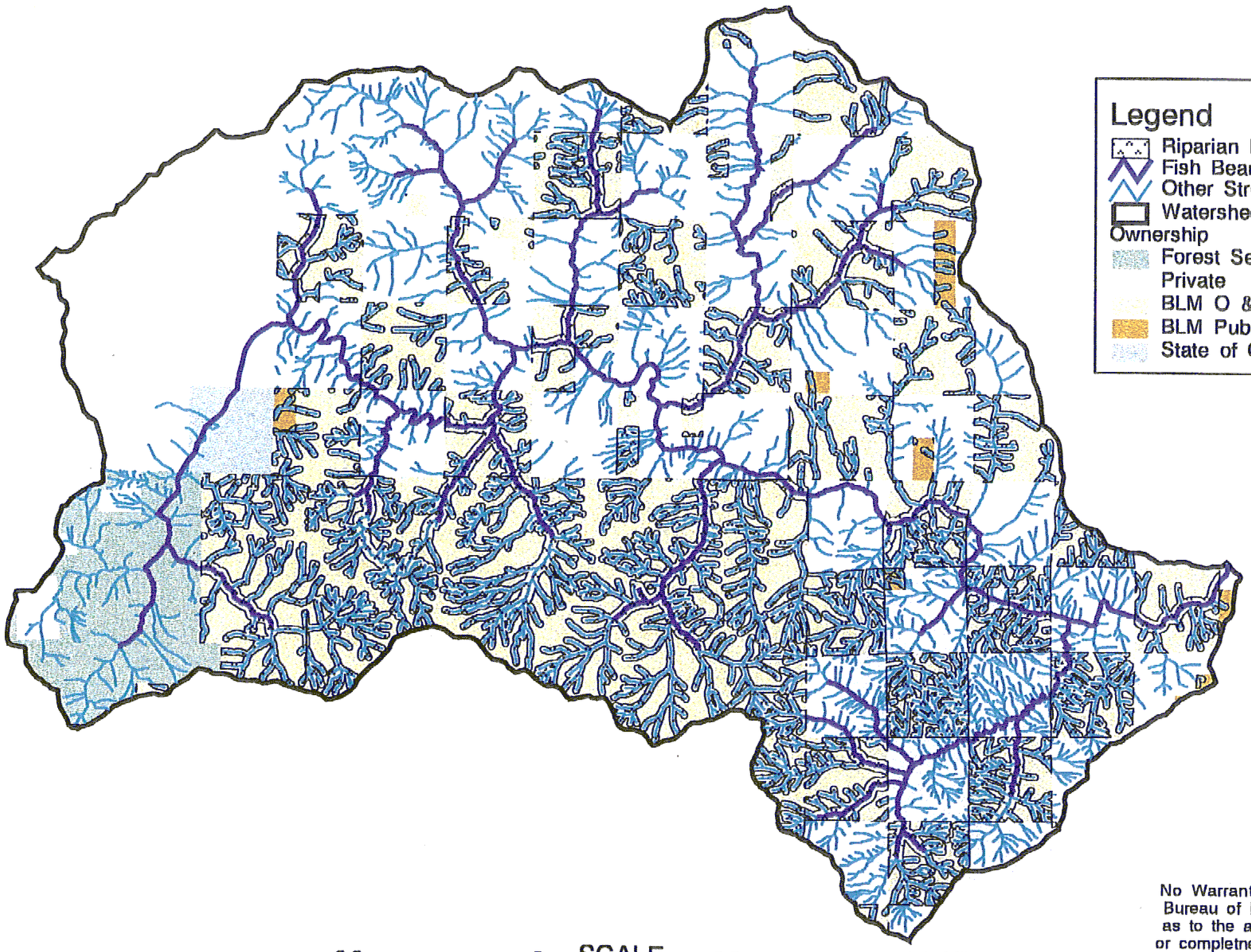
R. PIERLE, 11/21/96

Map 12.
West Fork Cow Creek
Riparian Reserves

R10W R9W R8W

T31S

T32S



Legend

- Riparian Reserves
- Fish Bearing Reaches
- Other Stream Reaches
- Watershed Boundary

Ownership

- Forest Service
- Private
- BLM O & C
- BLM Public Domain
- State of Oregon

2.2 0 SCALE 2.2 4.4 Miles

No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completness of this data for individual use or aggregate use with other data.

R. PIERLE, 11/2196

Trends in late-successional habitat quality and quantity

Most of the large blocks of late-successional habitat appear to be fairly stable. Most are uneven age stands with scattered, large conifers and patches of pole-size conifers. As individual large trees die, they are gradually replaced by conifers growing up from below. Low intensity ground fires may alter understory characteristics but the stands often retain the same structure and character. This state of "dynamic equilibrium", where the stands remain intact but undergo frequent, minor changes, accounts for the great variability in characteristics among older stands in the watershed.

However, there are several potential sources of major disturbances which significantly alter older stand structure, and at times entirely replace the stand with a younger stand.

The most important trend for late-successional habitat in the watershed is that stands on General Forest Management Area Lands and on private lands will continue to be logged. Outside of reserves and connectivity/diversity blocks, the GFMA lands will generally be less than 100 years old, and most will not provide late-successional habitat. This has already occurred on the vast majority of private lands and the remnants on private lands are not expected to remain much longer.

Another trend is that fire suppression has resulted in an accumulation of fuels which may increase the risk of large scale, intense fires which have the potential for being stand-replacing events. When and where they will occur is unknown, but the potential is increasing.

Another factor acting to reduce the abundance of older stands is the occurrence of wind-throw along roads and near the edges of stands when adjacent stands are logged. This is more evident in some places than others, but generally occurs to some degree within the first five years following logging.

The opposite trend, increase and improvement in late-successional habitat, will potentially occur over time in the various reserves in the watershed. Reserves have the potential to improve in late-successional habitat conditions through natural succession and with the help of direct management. Habitat quality in riparian reserves, marbled murrelet reserves, and spotted owl core areas should be maintained or improved. However, with the high fire frequency in the area, and the large extent of young plantations, it is likely fires will remove habitat within these reserves over the next several decades despite management actions to prevent the fires.

Species of concern

In general, most species of concern in the watershed are associated with late-successional habitat.

There are four special status vascular plant species which potentially could occur within the watershed:

Allotropa virgata
Cypripedium fasciculatum
Bensoniella oregana
Cimcifuga elata.

In addition species of fungi, lichens and other plants designated as Survey and Manage may occur here, but there is little or no information available on the distribution or habitat relationship of these species.

Wildlife species of concern within the watershed are listed in Appendix F. Wildlife species of concern include special status species, those designated as Survey and Manage in the RMP, and those designated for special protection in the RMP such as bats and cavity users. Spotted owls are the only federally listed terrestrial wildlife species known to occur within the watershed, although marbled murrelets have been documented a few miles west. The Umpqua cutthroat trout was recently designated as an endangered species and the Coho salmon is proposed as threatened (see Issue #1 - Fish Habitat).

More detailed information is presented here for some wildlife species of concern.

Northern Spotted Owl

The West Fork Cow Creek contains 12,321 acres of suitable (nesting, roosting and foraging) habitat for northern spotted owls, although it is fragmented due to past harvest activities and the checkerboard ownership (Map 13).

There are approximately 17,100 acres of spotted owl dispersal habitat in the watershed. In this watershed, dispersal habitat is generally achieved when forested stands approach 40 years old. Many of the stands on private lands will develop dispersal habitat characteristics over the next decade. How long they will maintain that condition before being logged is questionable.

There are 15 spotted owl activity sites known to occur in the watershed. Eleven sites are below the minimum level of habitat required before “take” occurs as defined by the Endangered Species Act (i.e., less than 40 percent of the area within 1.3 miles of the center of activity is suitable habitat). Most activity sites within the watershed are unstable, with only transitory reproductive success in recent years. Only 5 sites would be considered viable with a more stable reproductive history, and these sites are all located in the areas of BLM block ownership.

Map 13.
West Fork Cow Creek
Spotted Owl Habitat

R10W R9W R8W

T31S

T32S

OR-62

OR-67

OR-65

N W E S

Legend

- Critical Habitat Units
- Section Lines
- Watershed Boundary
- Nesting Foraging and Roosting Habitats

Ownership
- Forest Service
- Private
- BLM O&C
- BLM Public Domain
- State of Oregon

2.3 0 SCALE 2.3 4.6 Miles

No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completness of this data for individual use or aggregate use with other data.

R. PIERLE, 11/21/96

Twelve spotted owl core areas (100 acres each) are designated in the watershed. The spotted owl core areas are managed as unmapped LSRs. One of these core areas occurs on U.S. Forest Service Matrix land, one is located in the Bobby Creek RNA, and one is in one of the marbled murrelet reserve blocks. The other nine core areas are dispersed relatively evenly throughout the General Forest Management Area lands in the watershed.

Spotted owl critical habitat

The Spotted Owl Critical Habitat Unit (CHU) # OR-67 is designated in the southwestern portion of the watershed. The primary function of this CHU is to maintain the range-wide distribution of the northern spotted owl since it provides an integral portion of the link from the Klamath Mountains province to the southern end of the Oregon Coast Ranges province. Management activities within the CHU need to ensure that its function is not impaired.

With the implementation of the President's Forest Plan and Medford District RMP, LSRs, Marbled Murrelet Reserves, and riparian reserves could supplement the CHU in providing this important provincial link. The original function of the CHU should continue in the future despite timber harvest because so much of it is protected as marbled murrelet reserves, RNA, and riparian reserves. If management activities within the CHU are designed such that the designated reserves can sustain the function of the CHU, despite a degradation of spotted owl habitat within the CHU itself, then these actions would not adversely modify spotted owl critical habitat or jeopardize the existence of this subspecies. Future management actions which may affect critical habitat or a listed species would need U.S. Fish and Wildlife Service concurrence through the consultation process under the Endangered Species Act.

Marbled Murrelet

The West Fork Cow Creek watershed contains 12,000 acres of suitable marbled murrelet habitat (provides nesting characteristics). The western third of the watershed occurs in the zone designated in the Forest Plan as less than 35 miles from the coast (Map 14); the remainder of the watershed is in the zone 35-50 miles from coast.

As with the spotted owls and late-successional habitat, marbled murrelet habitat is highly fragmented, except in the Bobby Creek drainage, due to past harvesting activities and the checkerboard ownership pattern. Small stands suffer from edge effects which result in more exposed, open canopy conditions near the edges and also increase the potential for nest predation by Steller's jays and ravens. But murrelets would be more capable of using smaller patches of habitat for nesting than spotted owls.

Surveys conducted 1992-1996 have failed to document any murrelets using this watershed. An analysis done by the Siskiyou National Forest provides strong support for the contention that in this part of southern Oregon, murrelets do not fly inland beyond the first major coastal ridge, about 12 miles from the coast. This boundary is the limit of the coastal fog belt and the eastern edge of the Douglas-fir/hemlock community.

If this hypothesis is correct, the West Fork Cow Creek watershed should be considered outside the range of the marbled murrelet. In this case, the watershed would not play a part in the maintenance or recovery of this threatened species.

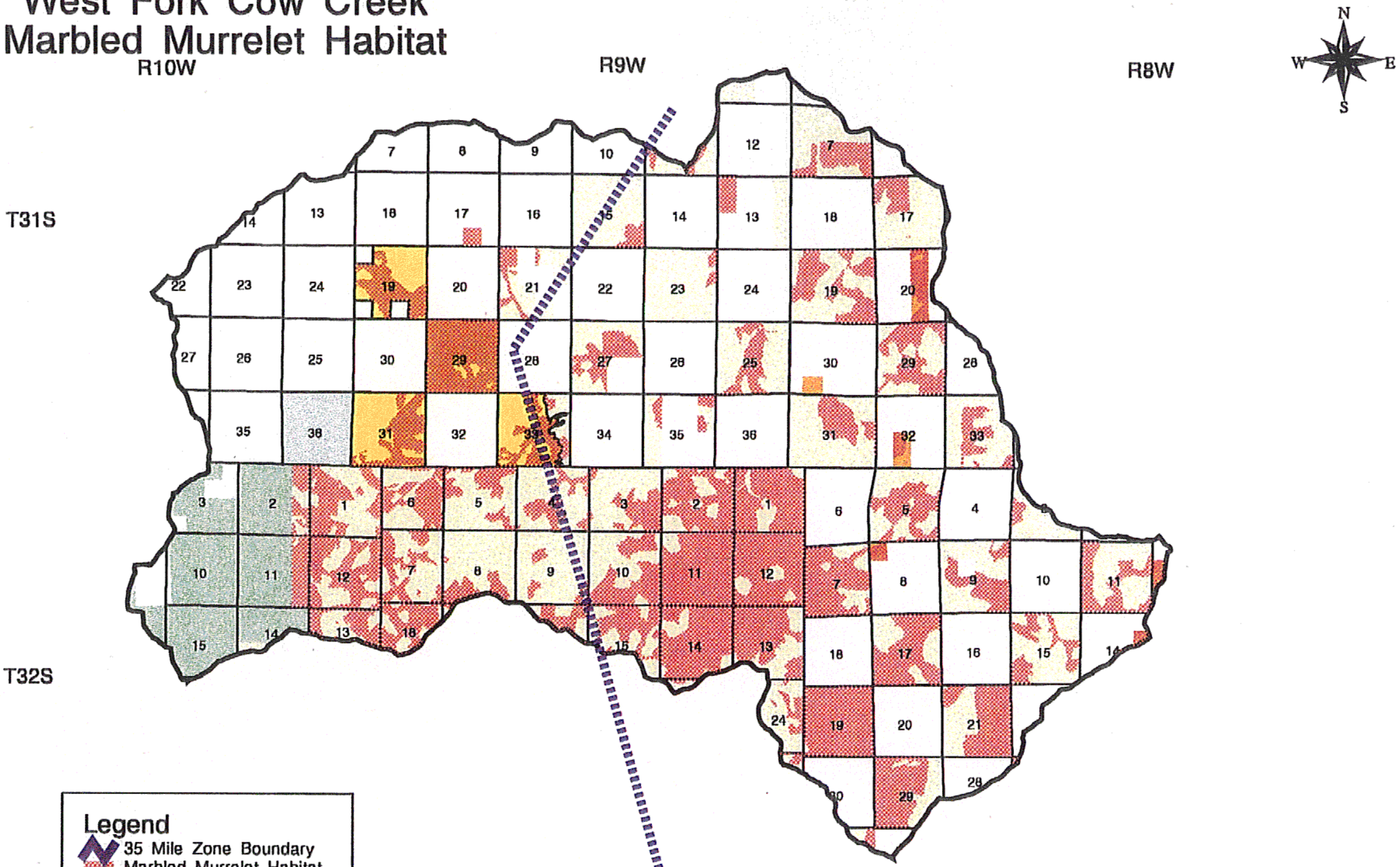
The marbled murrelet reserves in the western portion of the watershed are also designated as critical habitat for this species.

Del Norte Salamander

Del Norte salamanders have been documented in the watershed, in Bobby Creek, Bear Creek and in Elk Valley Creek near the northern edge of the watershed. These sightings represent an extension of the species' known distribution and may be near the northern limit of this species' range.

This survey and manage species is associated with rocky, talus slopes which provide adequate canopy cover to retain sufficient moisture to support the species. Small pockets of talus habitat are patchily distributed across the watershed. Because this species requires habitat characteristics which occur in disjunct patches, the species is susceptible to activities that degrade or destroy the suitability of those patches. Salamanders are susceptible to micro-climatic changes, particularly temperature and relative humidity. As timber harvest progresses in the watershed, this species will need to rely on isolated talus patches connected by riparian reserves for gene pool exchange and population viability.

Map 14.
West Fork Cow Creek
Marbled Murrelet Habitat



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Red Tree Vole

Surveys in 1995 and 1996 and analysis of spotted owl pellets have documented red tree voles in the watershed, particularly in the southern half of the watershed where the habitat is less fragmented and there is block federal ownership. Red tree voles have not been found in the northwestern portion of the watershed, which is primarily in private ownership and has been heavily harvested in the last 10-30 years.

It is expected that red tree voles would persist within stands older than 40 years old in the watershed which provide suitable habitat. Currently there are 12,321 acres of forest considered to be suitable habitat on federal lands in the watershed, which represents 59 percent of federal lands. However, the large areas of young stands within the watershed may be a significant dispersal barrier for this species for maintaining adequate population mixing.

Great Gray Owls

This species is also a Survey and Manage species and is associated with forest stands near meadows and other openings. Great gray owls have not been documented in the watershed, but recent tentative sightings have raised the possibility this species may be present but undetected. Surveys are planned to determine if they do occur in the watershed.

Elk Management

The watershed, particularly the Elk Valley drainage, was identified as a priority for elk management in the early 1980Port Orfords in cooperation with the Oregon Department of Fish and Wildlife (ODFW). It was also identified as an elk management area in the Medford District RMP. Increased elk vulnerability, combined with the low bull:cow ratio, limits the number of Roosevelt elk in the unit.

Concentrations of elk occur in Elk Valley, Upper Walker, Bobby, Stanley Creeks and Panther Ridge. Much of the rest of the watershed is steep and rocky, especially Bear Creek.

The primary habitat components affecting elk numbers in western Oregon are forage, hiding cover, thermal cover, optimal cover and open road density.

Forage in the watershed is currently available on recent clearcuts, mostly on private lands. Some limited permanent forage areas occur on scattered meadows and rock outcrops. There are very few permanent forage areas in the watershed.

Hiding cover is abundant, provided by 15-50 year old stands.

Thermal cover is generally adequate, but in the northern half of the watershed it is restricted to small, isolated patches.

Optimal cover (old growth) is fairly abundant in solid-block ownership in the southern portion of the watershed and is scarce in the north.

Road densities of about 4.6 miles of road per square mile exceeds the recommendation by ODFW of 1.5 miles of road per section.

Most of the recreational use of the watershed is limited to hunting seasons. During the rest of the year, recreational camping and other use poses very little long-term disturbance to elk.

Much of the forest on private lands in the watershed are 15-60 years old and have lost their value for elk forage. There are some areas of very recent timber harvest in the Bear Creek drainage and other areas which do provide some fairly high quality forage areas.

Hydrological Effects

Soils within the West Fork Cow Creek watershed have developed from sedimentary, metasedimentary, and metavolcanic rock types. The soils associated with the sedimentary rock type tend to be relatively deep and gently sloping. Soils developed from metasedimentary rock tend to be moderately deep on slopes less than 60 percent. Soils developed from metavolcanic rock types tend to be shallow.

A small portion of the metavolcanic zone contains serpentine-derived soils. Landslides associated with these soils occur in portions of Walker, Wallace, Gold Mountain, and Stanley creeks.

Map 15 depicts the basins in which one or more hydrologic parameters exceed desired levels, or "trigger values." The hydrologic parameters analyzed are:

-**Equivalent Clear-cut Area** (ECA) is a computed value which is time-weighted from the time of disturbance and decreases annually. Hydrologic conditions return to pre-disturbance levels in approximately 20 to 27 years. The trigger value is 25 percent of the watershed in equivalent clearcut area openings.

-**Transient Snow Zone opening** (TSZ) percentages are used to evaluate the risk of rain-on-snow events which potentially can destabilize stream channels downstream. Values exceeding 25 percent of the entire basin have the potential for channel alteration.

-**Soil Compaction** figures are correlated with increased runoff during rainfall events where percolation is reduced. Erosion and resulting sedimentation of stream courses are partially responsible for reduced spawning and rearing habitat for aquatic species. Compaction values above 5 percent of the watershed are considered problematic.

-**Road density** is a measure of drainage alteration and an increase of intermittent stream channels. The ditches on these roads act as stream channels during runoff events. Roads also intercept subsurface aquifers altering the natural hydrologic regime. Road densities above 5 miles per square mile are cause for concern.

On Map 15, green-colored basins do not have existing hydrologic problems. Yellow-colored basins indicate where one parameter exceeds the trigger value. Red color indicates two or three parameters exceed trigger values. The current values for ECA, TSZ, compaction and road density are listed in Appendix D. These data show that Compaction is the major hydrologic problem in this watershed, followed by Road Density and Transient Snow Zone Openings. Of the 47 seventh-field watersheds, 35 (74 percent) exceed the trigger value for compaction, 15 (32 percent) exceed the value for road density, and 13 (28 percent) exceed the transient snow zone opening value.

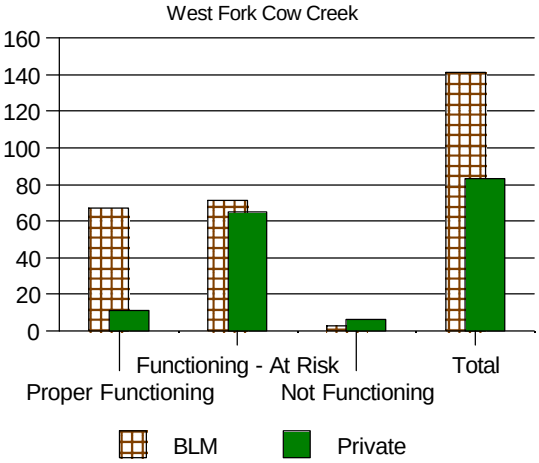
The major erosional processes in this watershed are:

- Road building,
- Logging activities which create soil disturbance,
- Dry ravel from adjacent slopes which fill intermittent stream channels,
- Translational and rotational land slides which direct channel deposits and dam stream channels,
- Floods,
- Road traffic, especially log hauling in wet weather periods, and
- Normal road maintenance activities.

Road building has created the largest erosion problems in the basin. The primary aspects adversely affecting the watershed include roads undercutting the natural slide areas, inappropriate road location and channeling water.

Figure 5 reflects the percentage of streams in the basin which are properly functioning from a hydrologic stand point. This evaluation of streams includes bank channel stability, coarse woody debris, riparian vegetation, and other parameters.

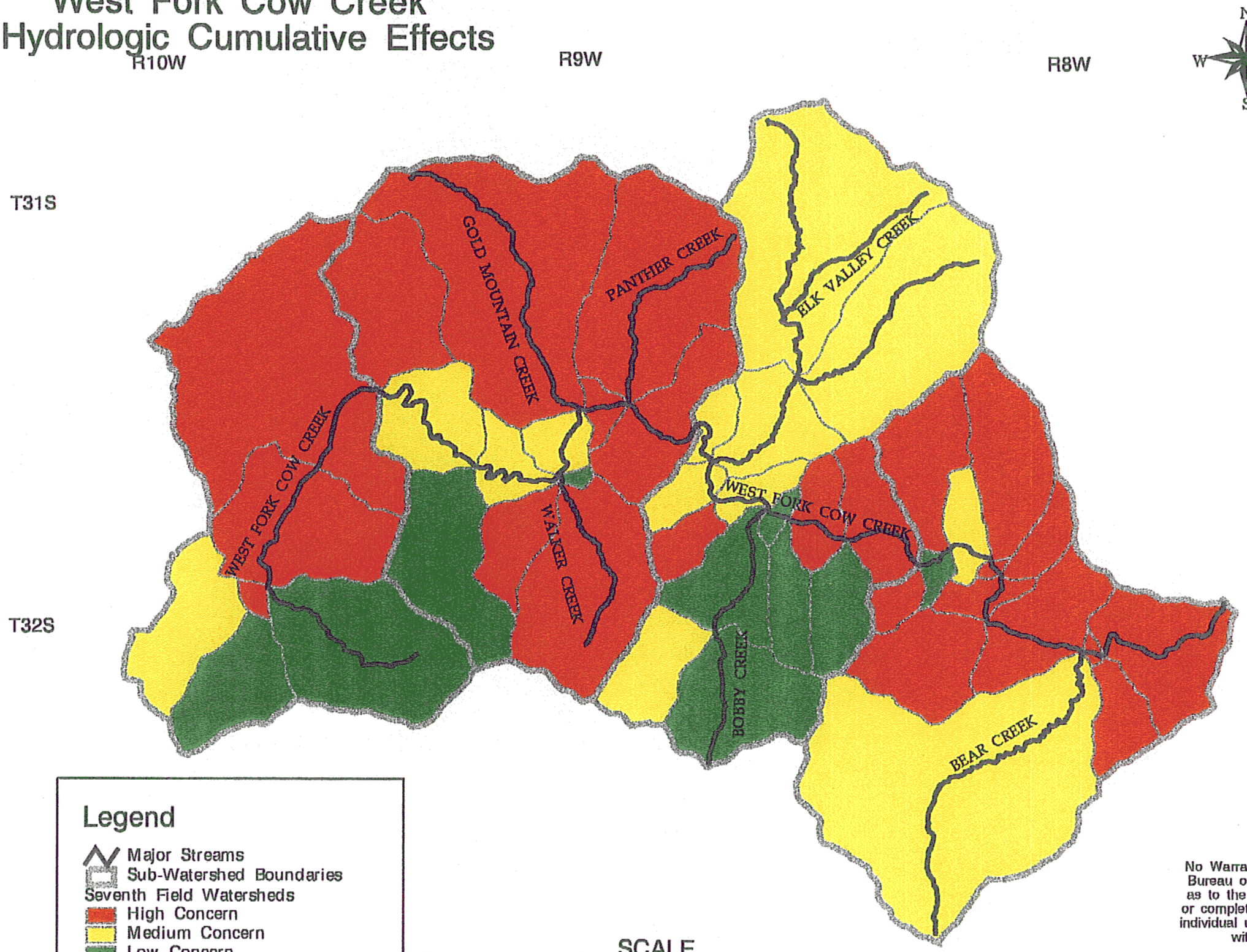
Figure 5. Stream Functional Condition Rating



The main stem of West Fork Cow Creek is a large, high energy stream. Riparian shading is minimal and coarse woody debris is naturally scarce since it is moved out of the system quickly.

Continuous stream flow records have been kept for 39 years on West Fork Cow Creek. The current gaging site is located 0.8 miles upstream from the mouth. A peak discharge, estimated on the basis of a slope area measurement, was computed at 15,700 cubic feet per second in 1964. The minimum recorded discharge was 3.0 cubic feet per second.

Map 15.
West Fork Cow Creek
Hydrologic Cumulative Effects



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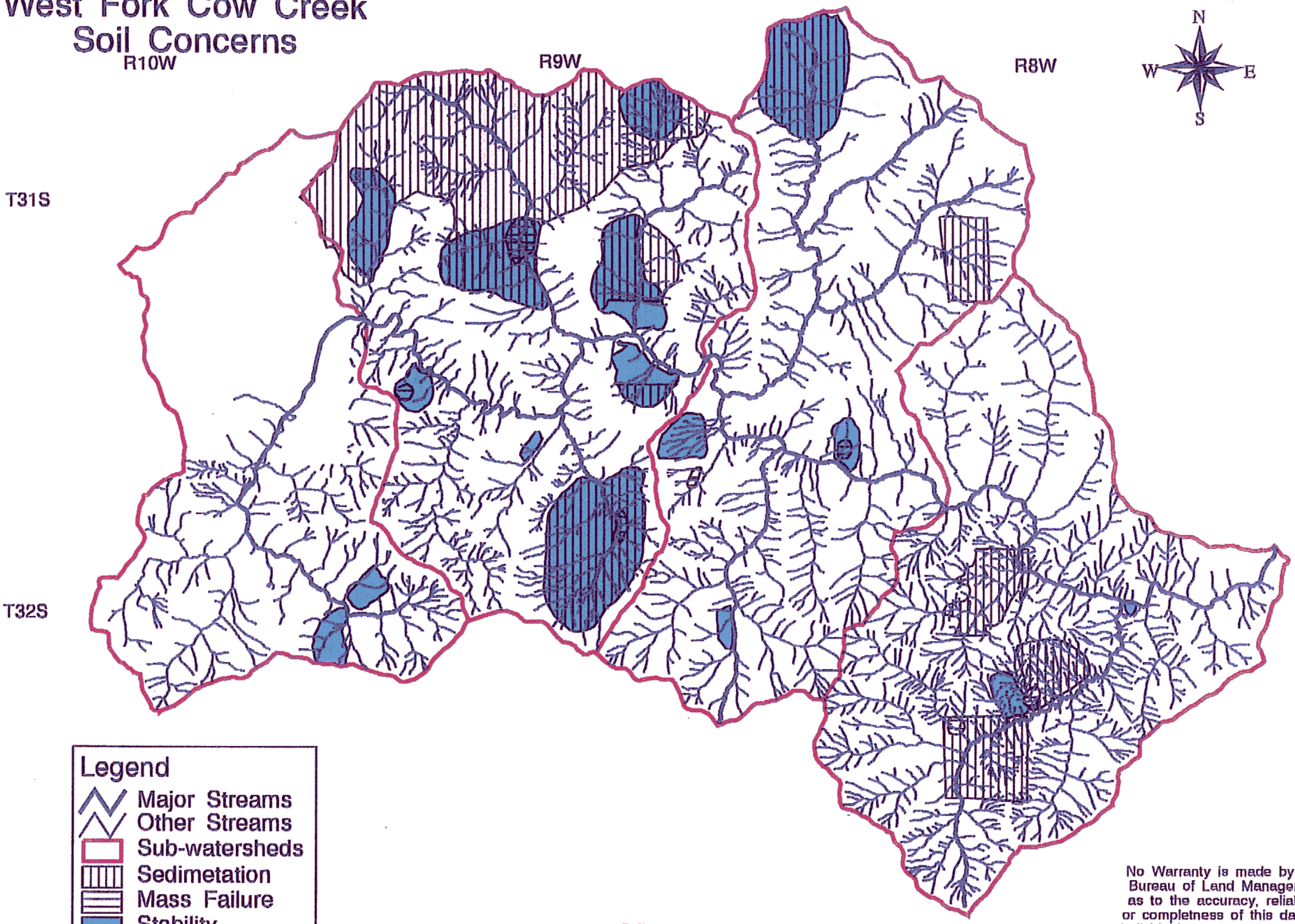
Map 16.
West Fork Cow Creek
Soil Concerns



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Summer and early fall discharges range from 5-15 cubic feet per second. This low flow regime causes pooling and slow water which allows for increased water temperature. Ambient air temperature and direct solar radiation frequently warm the water temperature higher than the optimal range for salmonid species.

Map 16 shows locations of known sedimentation sources. Most areas shown on the map have characteristics which have a potential for moderate to high erosion and sedimentation. Tractor logging has greatly contributed to sedimentation into stream channels on private lands.

Road building in the watershed has resulted in interception of surface and subsurface water flows. Roads have also channelized water into ditches and interrupted normal ground water flow and springs. The compacted road surface has increased runoff. Traffic on rocked and natural surface roads creates dust which enters streams during rainy periods. Improper maintenance of roads has led to failures of road prisms; discrete events which have contributed the most sediment to the system. The positions of roads on mid-slopes and in riparian zones have also greatly altered hydrologic functions within the watershed.

Human Uses

The majority of the people using the West Fork Cow Creek watershed come from the Glendale, Riddle, Powers, and Camas Valley areas with roughly 10 percent of the use coming from areas more than 50 miles away. Most of the users from outside the area are passing through on their way to or from the coast utilizing one of the main routes shown on Map 17. The majority of use in the area is limited to these main routes, all of which are paved with the exception of the Elk Valley Road. Use occurring off of these routes is generally limited to forest product operations and the various hunting seasons, the primary uses of the area at this time.

Hunters traditionally use a few camp sites along the major travel routes and some of the more heavily used secondary routes. Actions which increase the chances for hunter success, increase the number of areas suitable for camping (no facilities), and keeping roads open, are probably the best ways to maintain or improve opportunities and success for hunters.

Most hunting seems to occur within ¼ mile of roads in the area. Closing side roads may increase hunter density and lead to more conflicts. If other users begin to use the area more heavily during the hunting seasons, competition for the few campsites may increase even more; however, little overlap is anticipated as few non-consumptive recreational users want to occupy an area at the same time that hunters are actively searching for game.

There is some level of interest in the area for cycling - both mountain and road biking. The marketing consultants employed by Glendale and Powers have identified a need to integrate several different experiences into a "package" that tour guides and outfitters could then use as a starting point. Mountain bike rides, hikes, road bike rides, and rafting were all included. The West Fork Cow Creek watershed could be a valuable component in the overall plan to increase community stability for the "gateway" communities surrounding the Glendale - Powers Bicycle Area.

At present, few bike routes have been identified and none has been published. Expansion of dispersed recreation opportunities focusing on opportunities for these, and similar activities, though some of the more remote and higher quality areas would seem to be a logical focus. Higher quality refers to areas that provide scenic views, access to creeks, and having a variety of terrain or vegetation. Other attributes specifically of interest to cyclists are lack of vehicle access, variations in surface widths (2 to 6 feet), variations in surfacing including natural surface, processed gravel, and pavement, and variations in terrain. Unprocessed rock, generally two inches and larger, is not considered a suitable surface because of the large size of the material. Map 18 shows surfacing type on roads within the watershed.

There is also interest in designated vehicle tour routes. Vehicle tour routes should be limited to major routes, with the exception of the West Fork of Cow Creek Road and Walker Prairie Road. These roads were designated as the preferred route for cyclists under the Glendale - Powers Bicycle Area Project because the grades were less steep than those of the Bobby Creek Access Road. Encouraging vehicles to use the alternate road would reduce the amount of vehicle/bike interaction on the narrowest sections of road.

The Elk Valley Road provides access to Camas Valley and Union Creeks and is a popular route for local residents from both sides of the ridge. A large portion of the route is privately owned, with no legal, public access and cannot be designated as a tour route without permission from the owners and possibly purchase of easements, if the landowners are willing.

Hiking in the area is primarily limited to specific trails in the Wild Rogue Wilderness. Use and demand for this type of recreation in the area seem to be met by the existing opportunities. The only trailhead for the wilderness within the watershed is Mt. Bolivar. It consists of a very small turnout with parking for about two vehicles, a register box, and signing with a description and map of the trail. Current use does not tax these facilities. Any increase in use would probably be limited to the trailhead and the trail as the topography and vegetative cover of the area does not lend itself to off-trail hiking. Some improvements to accommodate more vehicles or sanitary facilities may become necessary if promotion of other areas increases use at this site.

Road Management

There are 418 miles of road within the watershed (Map 18). Road densities in seventh field watersheds range from 0 to 7.1 miles per square mile, with an average road density of 4.6 miles per square mile for the entire watershed.

High road densities occur in Panther, Stanley, Walker, Gold Mountain, Finger, Sweat, Soldier, Hayes, Slotted Pen, Honey Suckle, Goat Trail, Bear, and Jacob creeks, and in some frontal drainages.

For this analysis roads have been lumped into four categories: natural surface, large rock surface (i.e., pit run), small rock surface (crushed rock), and paved surface (Map 18).

Road surfacing on BLM roads within the watershed is presently in fair to good condition. The natural surface roads have a variety of surface conditions, with some stable and other eroding. Most private roads are natural surface and many are actively eroding.

A major portion of the culverts in the watershed have already exceeded or are nearing their life expectancy of 25 years. An inventory of the location, condition, and size of road culverts within the watershed is currently in progress.

Approximately 39 miles of BLM-administered roads have been closed by gates or barricades to protect elk and other resources (Map 17). Another 7.5 miles have been decommissioned. Roads in the northwest portion of the watershed, which are under the control of Georgia Pacific Corporation, are generally closed to the public. Georgia Pacific has opened some of their road system during hunting season.

Though not a major problem at the current time, several areas (Map 16) in the watershed have been identified as having high erosion potential, due to soil type, slide potential, and slope steepness. The erosion potential in these areas has been further amplified by road construction and tractor logging of private lands.

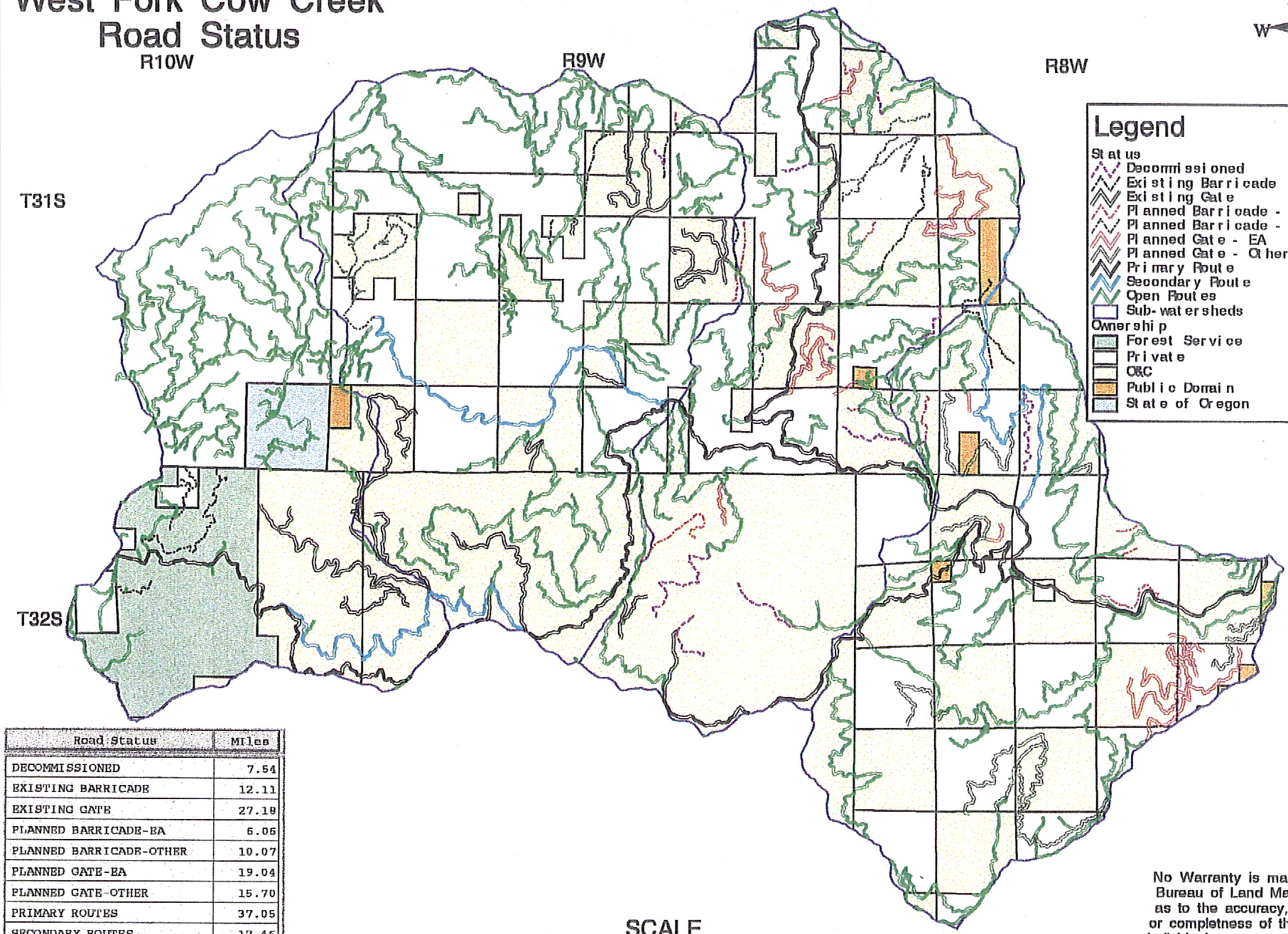
An analysis of potential future road construction needs indicates that virtually all of the private lands within the watershed have an adequate road system to accommodate future logging if tractor logging is used as in the past. New road construction in the watershed will most likely result from BLM management decisions, but will be limited by management direction in this Tier 1 Key watershed.

Map 17.
West Fork Cow Creek
Road Status

R10W R9W R8W

T31S

T32S



N
W E
S

Legend

Status
- Decommissioned
- Existing Barricade
- Existing Gate
- Planned Barricade - EA
- Planned Barricade - Other
- Planned Gate - EA
- Planned Gate - Other
- Primary Route
- Secondary Route
- Open Routes
- Sub-watersheds

Ownership
- Forest Service
- Private
- O&C
- Public Domain
- State of Oregon

Road Status	Miles
DECOMMISSIONED	7.54
EXISTING BARRICADE	12.11
EXISTING GATE	27.18
PLANNED BARRICADE-EA	6.06
PLANNED BARRICADE-OTHER	10.07
PLANNED GATE-EA	19.04
PLANNED GATE-OTHER	15.70
PRIMARY ROUTES	37.05
SECONDARY ROUTES	17.46
OPEN ROUTES	276.46
TOTAL MILES	438.59

SCALE

2 0 2 4 Miles

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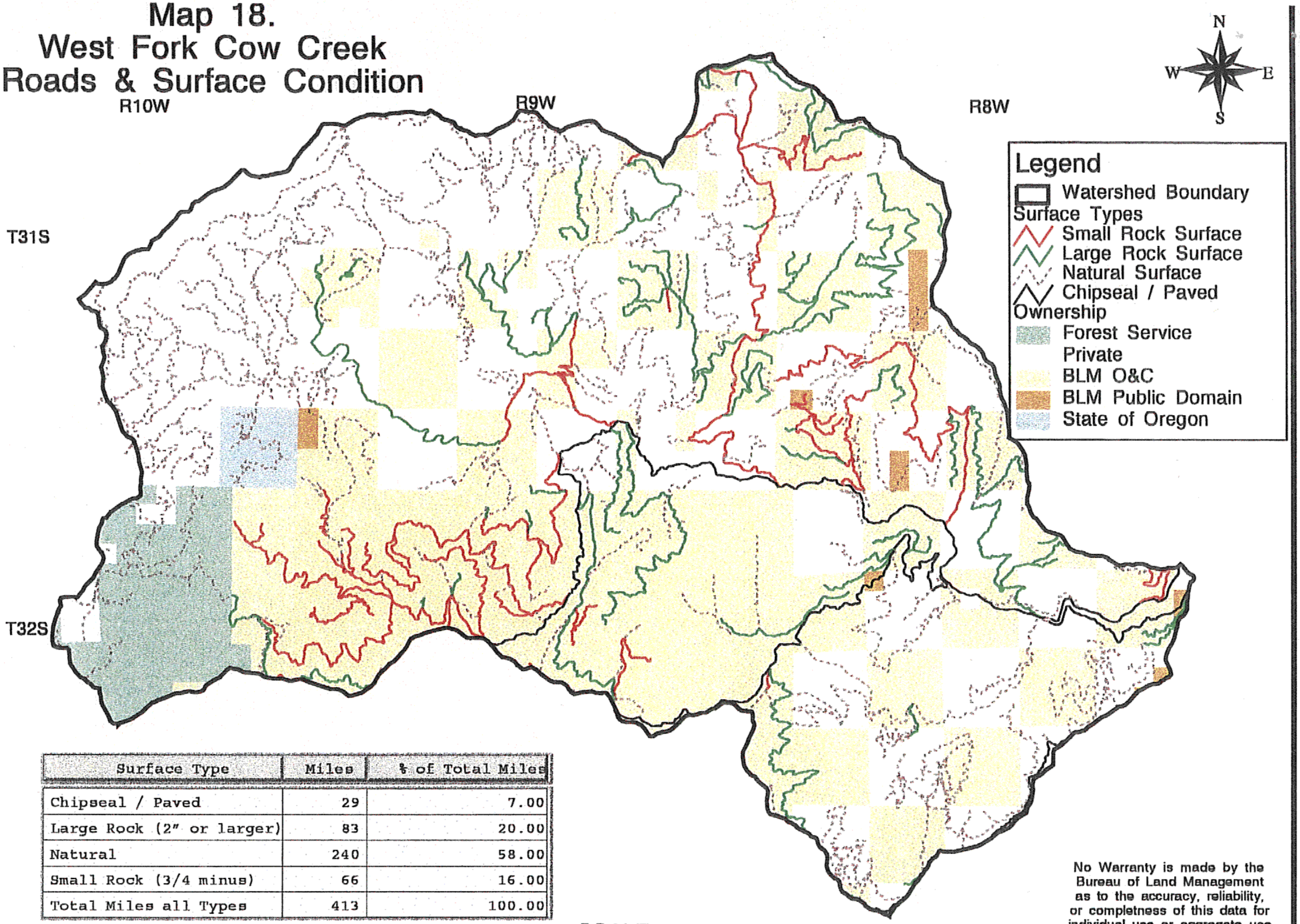
Map 18.
West Fork Cow Creek
Roads & Surface Condition



Surface Type	Miles	% of Total Miles
Chipseal / Paved	29	7.00
Large Rock (2" or larger)	83	20.00
Natural	240	58.00
Small Rock (3/4 minus)	66	16.00
Total Miles all Types	413	100.00

SCALE 1.8 0 1.8 3.6 Miles

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Forest Products

Timber

The timber in the West Fork Cow Creek watershed has historically been from high quality, large old-growth trees. Douglas-fir has been the main timber species, but other species also occur, most notably incense cedar, ponderosa pine, sugar pine, western red cedar, white fir, western hemlock and Port Orford cedar. The Port Orford cedar, while limited in distribution within the watershed (Map 8), is a high value resource which is also of concern due to the Port Orford cedar root rot disease which has been devastating cedar populations throughout southwest Oregon.

Virtually all the commercial timber on private lands within the watershed has been cut. Those lands are currently dominated by stands of conifers 15-35 years old, except on harsh sites where brush and hardwoods dominate with varying amounts of conifer regeneration.

On federal forest lands, timber lands are a mixture of old growth and recent clearcuts (Table 6 and Map 10). Approximately 1,426 acres of stands age 40-80 years old may be suitable and available for commercial thin harvest.

Timber harvest in the watershed essentially began in the mid 1950s Port Orfords. Aerial photos taken in 1953 show very limited logging. Since that time, clear cutting has been the predominant type of timber harvest. The BLM did a limited amount of partial-cutting in the 1950s and 1960s.

Reforestation success has been variable on private lands, with large areas of cut-over lands dominated by hardwoods and shrubs. Reforestation records on BLM lands show a fairly high level of reforestation success. Of the 7,428 acres logged, 6,705 acres (90 percent) have been reforested and are above target stocking levels and 519 acres (7 percent) are above minimum stocking levels. Only 204 acres (three percent) are below the minimum acceptable levels.

There are approximately 1,717 acres which have been partial-cut in the past which has reduced the stocking levels in the overstory. Understory conifer stocking varies from very little to fairly abundant and varying amounts of shrub and hardwoods exist in the understories. These stands are identified on Map 10 as "modified older stands."

There are other areas of the watershed which appear to have an understocked overstory component, but many of these are part of the plant communities not capable of supporting a closed canopy forest. This is generally due to site constraints such as natural soil type and conditions. These areas are classified as the Douglas-fir/tanoak canyon live oak vegetation sub-group(Map 6).

Harvested units and disturbed areas on BLM lands have been planted or reforested in some manner. These areas are intensively monitored and conifer stocking levels are managed.

Physical factors affecting productivity are related to plant community groupings. Soil conditions present the biggest variation within the watershed for timber growing capacity, with rainfall also playing a role. The annual precipitation ranges from 50 inches in the eastern portion of the watershed to over 100 inches in the very western regions.

The drier areas along rocky, shallow soils, such as in the Bear Creek drainage, combine to create the least productive areas of this watershed (Map 6). These stands typically have lower stand densities and canopy closure than stands on higher quality sites. These stands can be classified as the Douglas- fir/tanoak/canyon live oak subgroup. Low productivity also occurs on some of the south aspects throughout the watershed.

The areas of serpentine soils and the sandstone derived soils in Stanley Creek also have lower growth potential and support lower timber volume stands. These tend to be droughty sites with limited nutrients.

General productivity for the sixth field watersheds is illustrated in Table 7.

Table 7. Potential timber productivity, West Fork Cow Creek watershed.

Sixth-field Watershed	Net Acres GFMA/1	Estimated average potential volume per acre (MBF)	Total Potential Volume (MBF)
Bear Creek	2,258	30	67,740
Bobby Creek	2,596	50	129,800
Walker Creek	2,470	50	123,500
Wilson Creek	967	50	48,350
TOTAL	8,291	45	369,390

/1 GFMA acres exclude Riparian Reserves

Timber availability and land allocations

There are a variety of land use allocations designated in the RMP which restrict timber availability. These allocations include Late Successional Reserves, riparian reserves, spotted owl core areas, lands withdrawn from timber harvest for reforestation concerns based on the Timber Productivity and Capability Classification (TPCC withdrawals), Research Natural Area and others. Logging may occur in these allocations, but they will be designed to benefit those other resources and will generally not count toward the annual Probable Sale Quantity (PSQ).

Scheduled timber harvest occurs from the General Forest Management Areas (GFMA) and the Connectivity/Diversity Blocks designated in the RMP. These two allocations combined comprise the "Matrix" lands in the Northwest Forest Plan.

There are 17,471 acres of lands designated as General Forest Management Area, or 31 percent of the watershed. Within this allocation there are 1,195 acres withdrawn for various reasons, leaving 16,276 acres which are primarily available for timber harvest. There are also 3,797 acres (seven percent) in eight Connectivity/Diversity Blocks. Timber harvest is permitted here, but at least 25-30 percent of these blocks will be retained in late-successional condition.

Table 8. General Forest Management Area and Riparian Reserve acreage.

Sixth-field Watershed	Total BLM acres in Watershed	Total GFMA in base/1	Total GFMA in base, percent of watershed	GFMA in base, Outside Riparian Reserves	Percent of GFMA in base, outside riparian reserves
Bear Creek	7,605	4,511	64	2,258	50
Bobby Creek	8,897	4,646	52	2,596	56
Walker Creek	7,773	5,060	65	2,470	49
Wilson Creek	2,906	2,059	71	974	47
TOTAL	27,181	16,276	61	8,298	51

/1GFMA lands outside of other mapped reserves. This acreage still includes Riparian Reserve acreage.

In developing the RMP it was impossible to accurately determine the amounts of riparian reserves which overlap the GFMA. It was estimated that 45 percent of the lands in the Medford District would be encompassed by Riparian Reserves. Since then, field surveys have been conducted within the watershed to determine the locations of perennial and intermittent streams and the acreage of associated riparian reserves (Map 12).

The data in Table 8 show that approximately 51 percent of the GFMA occurs outside Riparian Reserves. In other words, Riparian Reserves overlay about one-half of the GFMA lands. Thus, while the mapped GFMA makes up 31 percent of the watershed, the GFMA actually available for intensive timber management is about 15 percent of the watershed. This compares quite well to the 45 percent used in modeling the Medford District Probable Sale Quantity (PSQ).

The riparian reserves frequently break up the GFMA lands into small, fragmented stands (Map 19). This can make management of these stands more difficult and expensive.

Special Forest Products

Because of the remote nature of the watershed, use of most special forest products has been limited in the past.

There are a wide variety of special forest products in the watershed, none of which are presently as economically important as timber. However, the potential remains for increased use of these products as interest evolves with a changing timber harvest plan.

Traditionally, firewood has been the product most in demand. The distance of this watershed from residential areas has kept the interest moderated as compared to areas closer to towns.

Other products in the watershed include:

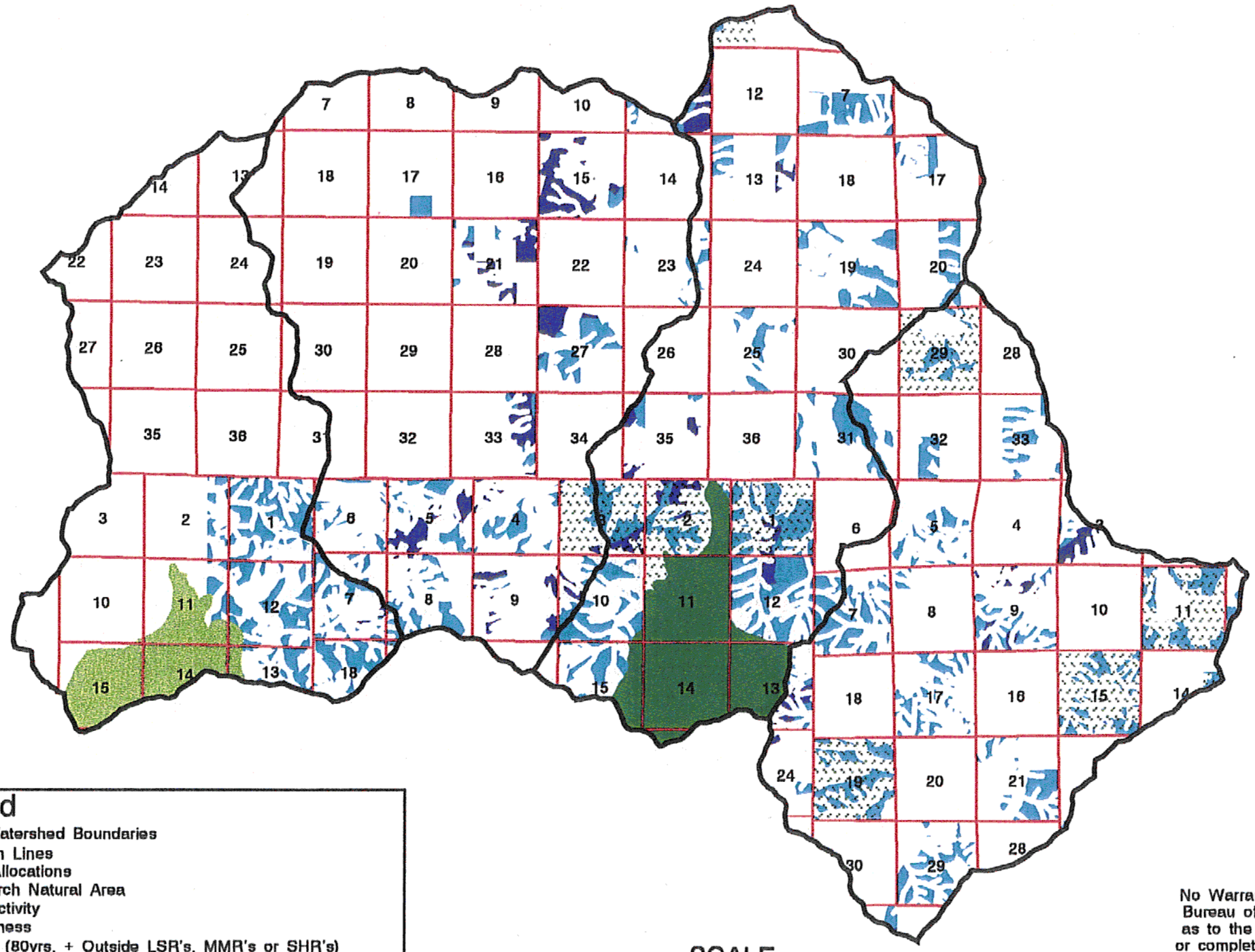
- seasonal decorative tree boughs,
- Christmas trees,
- mushrooms,
- decorative wood products such as burls and manzanita branches,
- Pacific yew for bark (taxol), shakes and shingles,
- posts and poles for fencing and building,
- beargrass, and
- various shrubs used in floral arrangements (fern, salal, evergreen huckleberry).

Map 19.
West Fork Cow Creek
GFMA / Outside Reserves

R10W R9W R8W

T31S

T32S



Legend

- Sub-Watershed Boundaries
- Section Lines

Land Use Allocations

- Research Natural Area
- Connectivity
- Wilderness
- GFMA (80yrs. + Outside LSR's, MMR's or SHR's)
- GFMA (40-80yrs. + Outside LSR's, MMR's or SHR's)

2.2 0 SCALE 2.2 4.4 Miles

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R. PIERLE, 11/21/96

IV. Synthesis

The purpose of this section is to pull together the issues and elements influencing the West Fork Cow Creek watershed and examine their interrelationships. The interaction of the Key Issues, as well as other factors, was examined by the interdisciplinary team. This portion of the document attempts to highlight the most significant effects. More detailed analyses which provide background information can be found on file in the Medford District BLM office.

In this section the major influences on each Key Issue are described, followed by a discussion of the interactions between the issues within the watershed.

Fish Management

The overwhelming element affecting fish is the influence of roads. Culverts such as Twin Culverts on Elk Valley Creek impede or block passage of adult fish and preclude passage of other aquatic organisms. Road densities of 4.5 miles of road per square mile cause sediment to enter streams, and channel water more rapidly into stream channels, increasing stream flows. Lack of maintenance and plugged culverts contribute to increased sedimentation to stream channels. The increased volume of water results in changes within and adjacent to channels and changes habitat conditions for fish.

Improper road location within riparian zones and on mid slopes increase the potential for severe adverse impacts on fish habitat as a result of slumps and road failures.

In some cases roads run along streams within the Riparian Reserve, frequently interfering with some of the functions of the reserve. When a major arterial road runs along a stream, when the road is on steep slopes involving large cut and fill slopes, or when vegetation clearing within the right-of-way is wide, several functions of the riparian reserve are precluded. Large wood above the road is unable to enter the stream when the tree falls. Sunlight is able to shine through the right-of-way, so shading is permanently removed. Forest habitat for salamanders and other species is removed and connectivity is interrupted. In this watershed notable examples of this situation exists along the main stem of Elk Valley Creek, upper West Fork Cow Creek, Panther Creek, Slotted Pen Creek and others. These effects are not as severe on roads where the road cut and clearing are smaller and the slopes are less steep.

Compaction associated with timber harvest, particularly on private lands where large scale tractor logging has occurred, reduces percolation rates and increases runoff and erosion rates. Timber harvest on private lands removes vegetation within riparian zones which increases water temperatures and removes sources of large woody debris for stream channels. The Aquatic Conservation Strategy of the Northwest Forest Plan adequately protects existing riparian and stream habitat on federal lands, but does not affect what happens on private lands within the watershed. Nor does it restore riparian areas on federal lands which have been logged over the past 40 years.

Habitat Conditions

The removal of timber on public and private lands has had the greatest effect on the direct loss and fragmentation of late-successional habitat in the West Fork Cow Creek watershed. Extensive clear-cut timber harvesting has resulted in a watershed which has highly fragmented patches of late-successional habitat. This fragmentation is particularly prevalent in the northern portion of the watershed with the intermingled federal and private ownership pattern, where late-successional habitat has been virtually removed on all private lands. This trend of late-successional habitat fragmentation and removal is expected to continue, particularly with the 100-year harvest rotation on public lands and the private land harvest rotation of less than 60 years.

The extensive network of roads associated with logging activities within the watershed has added to the fragmentation and direct removal of older forests, reducing the effectiveness of late-successional habitat patches even further. This effect is intensified in smaller patches of habitat, such as in the northern portion of the watershed.

Under the Aquatic Conservation Strategy of the Northwest Forest Plan, Riparian Reserves were designated to manage for fish and other aquatic resources, as well as terrestrial species associated with late-successional habitat, including spotted owls, salamanders, vascular plants, fungi and lichens. Retention of these Riparian Reserves also benefits late-successional species by providing connectivity of late-successional habitat throughout the watershed. Even though much of the West Fork Cow Creek watershed is designated as General Forest Management Area on public lands, Riparian Reserves are designated on almost 50 percent of these GFMA lands. Many of the Riparian Reserves are not currently in late-successional condition from past timber harvest, but they should attain late-successional habitat conditions in 40-80 years. Retention of Riparian Reserves and the Bobby Creek RNA on public lands under the RMP will provide an extensive network of late-successional habitat connectivity within and through this highly fragmented watershed. Because much of the watershed is either allocated to GFMA on the public lands or is private land, it is expected that these Riparian Reserves will provide almost all connectivity within the watershed in the future, especially across the checkerboard ownership landscape.

The two major obstacles in maintaining this connectivity with Riparian Reserves is the location of roads in many of the reserves and the interspersion of private lands. Roads can form an effective barrier to movement for many species associated with late-successional habitat, as well as deteriorating the reserve by heating and drying out the understory. Riparian Reserves end at the private property boundaries, so connectivity is often greatly compromised across these lands.

Beside the Riparian Reserves, other allocations will help provide long-term sources of late-successional habitat, including: Connectivity/Diversity Blocks, marbled murrelet reserves, spotted owl core areas and the Bobby Creek RNA. These areas will provide a core patch of habitat, but will benefit from the

Riparian Reserves by forming the connectivity between them.

While the Riparian Reserves will provide connectivity for movement of late-successional species through the watershed, the continued fragmentation and removal of late-successional habitat may not retain sufficient patches to sustain many of these species. Most species associated with late-successional habitat are expected to decline in the GFMA and on private lands. These species will need to rely on the Bobby Creek RNA or the two Late-Successional Reserves associated with the watershed for relatively large blocks of late-successional habitat.

Managing the location and timing of timber harvest can reduce the effects of fragmentation in space and time. The older seral stage forest stands generally provide the highest quality timber. One consideration for obtaining forest products in a highly fragmented ecosystem is to determine whether it is better to remove the many small, fragmented late-successional stands or remove parts of the larger blocks, leaving the small patches intact. The small fragmented stands of late-successional habitat are not contributing substantially to late-successional habitat within a highly fragmented area which already presents a large barrier to movement or dispersal of species. Removal of these patches may then eliminate any refugia, as well as movement through the watershed. This has already effectively occurred in the northern portion of the watershed where large areas of younger stands form a barrier to movement for some species.

However, removing parts of the larger, currently intact blocks of late-successional habitat would fragment those stands, reduce their habitat effectiveness, reduce connectivity between those stands, increase the fragmentation and barriers to movement, and threaten the persistence of species associated with late-successional habitat in the watershed.

Spotted owl numbers are expected to decline over the next few decades as suitable habitat on federal lands is logged. Dispersal habitat should remain adequate as younger stands grow. Species with more limited mobility may find adequate pockets of habitat in reserves, but these populations will become increasingly isolated and subject to loss through fires or windstorms. Removing or altering the suitability of habitat for Del Norte salamanders, for example, may reduce the distribution of this species within the entire watershed since they have a very patchy, disjunct distribution naturally.

Elk Management

The most important factors affecting elk in this watershed are roads and timber management. The current road system poses major concerns for harassment and poaching, as well as increased mortality from legal hunting. All of the sub-watersheds are well above the target road density of 1.5 miles per square mile proposed by the Oregon Department of Fish and Wildlife. The current emphasis on closing roads to motor vehicle use will help the situation, but there are limits to the potential for this effort because of the intermingled

private lands and the need to maintain access for those land owners.

Timber management on private lands has created large clearcuts in recent years which provide good forage conditions in those areas. This will continue, but will be localized in its effect because most of these lands have already been cut. As they mature, these stands will cease to provide elk forage. Timber management on federal lands will also improve forage conditions for the first decade following a regeneration harvest. Timing and spatial arrangement of timber harvest can generally be designed to promote continued quality elk habitat.

Hydrologic Effects

Similar to fish habitat, the two elements having the greatest impact on the hydrologic functions of the watershed are roads and compaction. Runoff from compacted areas, interception of ground and surface water by road cuts and channelization as a result of roadside ditches increase flows to stream channels.

Secondarily, roads located on unstable soils, as in Walker Creek, contribute sediments episodically in the form of slumps and washouts during periods of heavy precipitation. The Aquatic Conservation Strategy restricts building roads within the watershed on federal lands, but stops short of regulating private land activities, which have the largest impact to this Tier 1 watershed.

Widespread timber harvest, particularly tractor logging on private lands, also has substantial impacts on the hydrologic functions in the watershed. Much of the compaction problems seen over the watershed stem from this problem.

Human Use

Closing roads to protect resources concentrates current uses and users in smaller areas, leading to competition for limited resources such as campsites. Increased concentration and competition may lead to conflicts among users and uses.

Restricting vehicle access provides opportunities for uses which are not currently occurring in the area such as mountain biking. Encouraging new uses may bring more conflicts in the form of mixed use of existing roads which are not closed and possibly some increased competition for campsites. It is believed this conflict may be minimal because the peak seasons for the various uses do not overlap very much. The exception to this may be for timber harvest and hauling activities utilizing roads that recreational users share throughout the operating season. These conflicts may be minimized through communication with users or some form of temporary closure to the conflicting use during the peak time of use. For example, roads may be closed to motor vehicle traffic while a large cycling event occurs, or a road may be closed to recreational traffic while timber hauling occurs.

Another complicating factor is that in some cases private land owners, such as Georgia Pacific, close their roads to public motor vehicle use.

Roads

The primary reason for the road network in the watershed has been timber management. This will continue to be the case in the future.

Most new road construction in the future is most likely to occur on BLM lands since the private lands are adequately roaded already. However, since the watershed is a Tier 1 Key watershed, where the management direction is to reduce road density, road construction will be substantially limited. As a result, few new roads on BLM are expected either.

As the road system continues to age and deteriorate, road maintenance needs will increase to maintain properly functioning surfaces and to clean and replace aging culverts to prevent major road failures. In addition, the Aquatic Conservation Strategy calls for installing culverts to pass a 100-year flood.

Virtually all of the BLM lands in the northern portion of the watershed are under road use or reciprocal right-of-way agreements. This may make it difficult to decommission roads to prevent erosion, or even to close or restrict access to roads. Without cooperation from private land owners in the watershed it will be difficult to accomplish these objectives. Cooperation between private land owners and BLM has occurred in the past and may continue in the future.

Forest Products

Based on a rough estimate of about 369 million board feet potentially available (Table 7), and assuming a 100 year rotation, the estimated annual sale quantity for this watershed is about 3.7 million board feet. This rough calculation is close to the 3 million board feet calculated by the district using the Trim Plus program. However, these estimates do not entirely account for the other restrictions placed on timber harvest as described below.

Alternatively, harvest levels can be examined with an area control rather than a volume control. With 8,291 acres available and assuming the same 100 year rotation, it is likely that cutting timber on 83 acres per year is sustainable. It must be emphasized that these are only rough estimates.

The most important factor affecting timber management in this watershed is the riparian reserves. These allocations directly reduce the available General Forest Management Area (GFMA) lands by about one-half. And indirectly, they fragment the remaining GFMA lands into small, often isolated patches which create logging problems, difficulties for slash burning and increased costs for site preparation and reforestation.

Another major factor is the additional reserves and constraints expected to be placed on GFMA timber management for protection of Survey and Manage as well as other special status plants and animal species. The effects of all these projected restrictions are presented in Table 9. There is a great deal of uncertainty involved in these estimates.

The analysis summarized in Table 9 indicates that approximately 45 percent of the available commercial timber in the watershed may be made unavailable for timber harvest by current standards and guidelines in the RMP. If true, this indicates a sustainable annual harvest for this watershed of about 1.6-2.0 million board feet, rather than the 3.7 million derived above, or 3.0 million board feet projected by the Medford District Trim Plus model as the Probable Sale Quantity. While the accuracy of the projections in Table 9 are suspect, it appears clear that a PSQ of 3 or 3.7 million board feet per year may be unrealistic.

Table 9. Potential future restrictions on timber availability on GFMA lands in West Fork Cow Creek watershed.

Type of restriction on timber availability	**Estimated percent reduction of GFMA availability within the watershed (range)**
Del Norte Salamander - retain 40% canopy around talus	20 (15-40)
Survey and Manage - 1999 (Plants, bats, mollusks) **Very Uncertain**	15 (10-30)
Uneconomical/Unfeasible (UE/UF)	5 (2-10)
Red Tree Voles	5 (1-5)
New owl sites/CHU	0
Raptors and other Special Status Species	0
Watershed parameters (compaction, transient snow zone, ECA, etc.)	0
Recreation/Wildlife/Late-successional	0
Potential fish listing as T/E	0
Total Potential Reduction	**45 Percent**

The trim plus model did take into account some level of protection for survey and manage, however, the actual reductions may be larger than predicted.

Also, management guidance to minimize road construction in this Key Watershed restricts harvest and makes it difficult and expensive to reforest harvest units.

There is a great deal of uncertainty surrounding the projected restrictions, but they are based on the best professional judgment of the specialists on the interdisciplinary team. Recent experience in implementing timber sale layout and marking using the survey and manage guidelines for Del Norte salamanders and protection measures for red tree voles and riparian reserves indicate this level of additional restriction is not unreasonable to expect. However, the experience is too limited to accurately forecast the effects on this watershed.

It appears that harvesting an average of 1.6-2.0 MMBF per year within the watershed is probably sustainable in the long term, without seriously jeopardizing concerns and objectives for wildlife, watershed and biodiversity values. At this level of harvest, these concerns can be dealt with through the timing and location of timber sale activities within the watershed. However, harvesting the projected 3.0 MMBF per year is probably not sustainable over time without seriously affecting other resources. This is not a failing of the initial trim plus run, but rather a closer look at on-the-ground conditions and melding a variety of issues and objectives.

Overall Synthesis for the West Fork Cow Creek Watershed

"Not only are ecosystems more complex than we think - they are more complex than we can think" (J.W. Thomas in Ruggiero, et al. 1991). Attempting to synthesize the complex ecological interactions within a watershed is a daunting task. The interdisciplinary team approached this task by trying to focus on the most important processes and interactions in the watershed. It is clear that not all the interrelationships are analyzed, but the most important ones were discussed. As new information or understanding becomes available, these analyses will be re-examined.

A graphical model was used to help make the interrelationships among Key Issues more understandable and useable for managers, specialists and the public (Figure 6). No doubt this drastically simplifies the situation, and some readers may find the diagram confusing. But it is one approach to viewing the relative importance and flows of influence within the watershed.

In Figure 6 the arrows from one element to another indicate that the first element has a direct effect on the second.

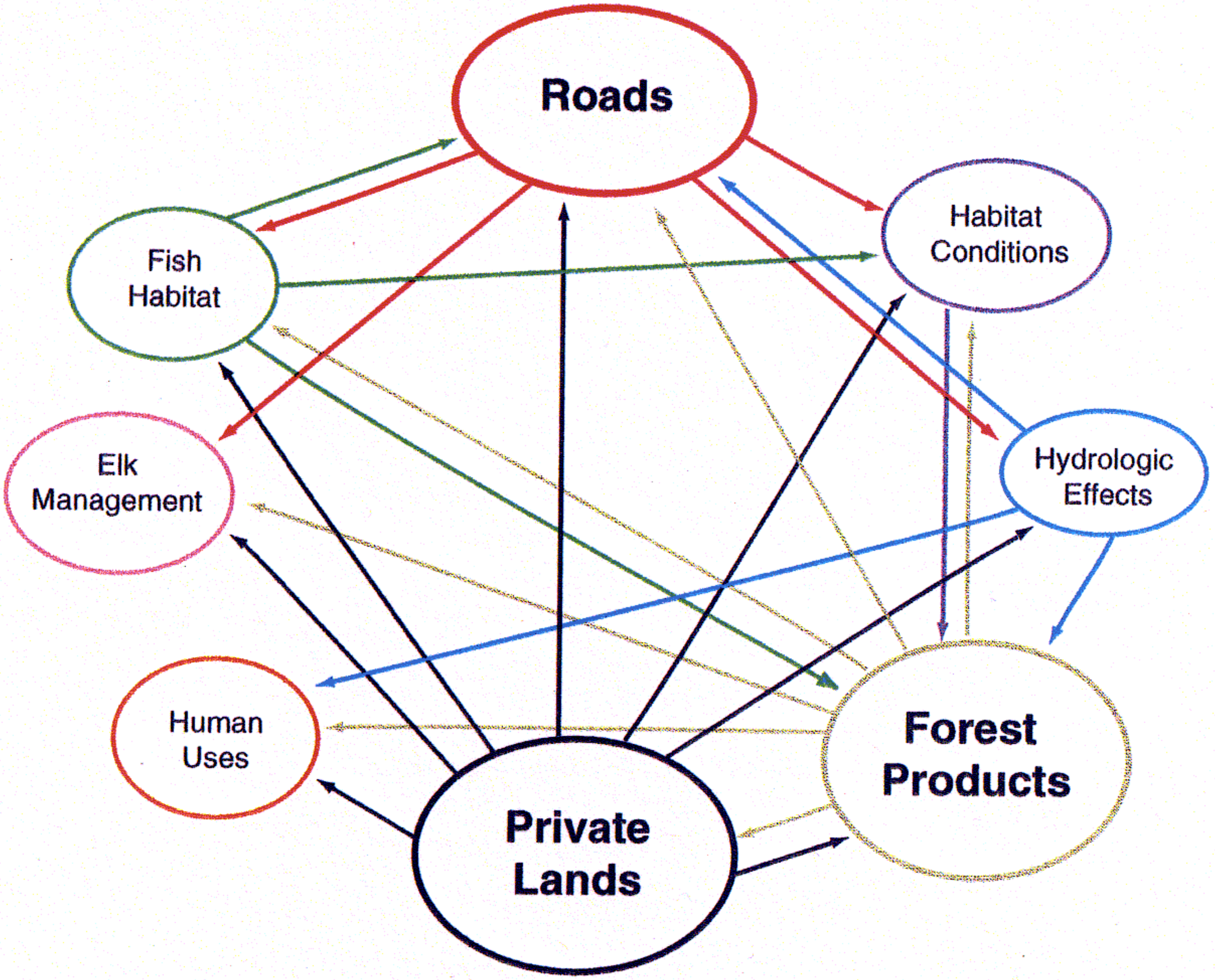
One conclusion to be drawn from Figure 6 is that the issues and elements which have the greatest impact on other issues in this watershed are: roads, private lands and forest management.

The road density and conditions in the watershed pose a very large concern for fish habitat and water quality. They also directly influence all the other Key Issues by providing access for commercial and recreational use, fragmenting forest habitat and increasing disturbance to elk and other wildlife. As the road system ages the associated problems are expected to worsen over the next decade.

The intermingled private lands also have a great impact on all the Key Issues, largely through intensive timber cutting and road building. These impacts will continue in the future, although the direct impacts on wildlife and streams will vary as different parts of the watershed reach commercial age. While the Oregon Forest Practices Act provides some protection for streams and other resources, the levels of protection are lower than are provided for public lands by the RMP.

Based on the analysis in this document, the following projections for the Key Issues were made by the interdisciplinary team. Given current practices, it is likely that fish habitat conditions and hydrologic functions will decline, or may be maintained at best. Late-successional habitat will decline under the best scenario. Road conditions will probably decline or be maintained. Forest products will improve, as will elk habitat. Human uses are difficult to assess, since the same change will be interpreted as improvement by some people and as a decline by others.

Figure 6. Interrelationships of Key Issues, West Fork Cow Creek Watershed. Arrows illustrate the direction of the impact. Emphasis added to issues having the greatest effects on other issues in the watershed.



V. Recommendations

Management recommendations are presented here based on the analyses presented in this document. First a long-term landscape design is described and presented in a map. Following this is a discussion and map showing priority management actions for the next 10-20 years. Finally, specific recommendations for individual issues are presented.

A. Projected Long-Term Landscape Design

The primary factor shaping the long-term landscape design for this watershed is the land use allocations in the RMP and the Northwest Forest Plan. This watershed analysis did not develop significant departures from, or modifications to, these allocations.

The projected long-term landscape design is presented in Map 20. This map shows the general vegetative condition expected to be present in the watershed 100 years from the present.

There are six basic categories of vegetation conditions based on the projected management in this watershed: private timber lands, late-successional habitat, Connectivity/Diversity Blocks, lands withdrawn from intensive timber management due to biological limitations (TPCC), General Forest Management Area (GFMA), and GFMA where connectivity is an added consideration. These categories are briefly described here.

Private timber lands: It is assumed that these lands will continue to be intensively managed for timber. The remaining older stands will be cut within the next decade and in the future forest stands will generally be 0-40 years old. Only very limited areas will exist in an older condition.

Late-successional forest habitat: This category includes several land allocations where late-successional habitat is either a direct management objective (e.g., LSRs, marbled murrelet reserves, spotted owl core areas and riparian reserves) or will occur as a result of other management objectives (e.g., wilderness and Bobby Creek RNA). There are some important differences to consider. In the former group, if a major disturbance such as fire or a major wind storm eliminates late-successional habitat, management direction is to actively promote the re-establishment of late-successional conditions as rapidly as possible. This is not the case in the wilderness or the RNA. In these two areas natural succession will be allowed to occur so late-successional habitat recovery may take longer.

There are approximately 7,731 acres of late-successional forest habitat within established reserves. This represents 28 percent of the BLM lands and 14 percent of the entire watershed. This habitat is expected to persist in the next several decades, although natural disturbances such as wildfire and windstorms are likely to remove some habitat.

Lands withdrawn from intensive timber management due to biological limitations (TPCC): These lands will generally resemble conditions in the late-successional category. There is no direction to manage these lands for late-successional habitat, but they are not to be managed for timber either, so they will generally develop into late-successional conditions on their own. A small sub-set of this category will naturally remain in a non-forested condition due to their rocky soils or low productivity.

Connectivity/Diversity Blocks: In this allocation the blocks will consist of at least 25-30 percent late-successional habitat. The rest will contain lands similar to those found in the GFMA.

General Forest Management Area (GFMA): These lands are prescribed for a rotation length of 100 years. The result will be a mosaic of stands between 0 and 100 years old distributed relatively evenly within the watershed, with each age class in approximately even proportions. Large structure legacies (green trees, large snags and coarse woody debris) will be retained on these lands.

GFMA where connectivity is an added consideration: This area, in the southeast portion of the watershed, is the only major modification to the basic land allocations. In this area at least 30 percent of the landscape will be maintained in late-successional condition to promote connectivity of species associated with late-successional habitat across the watershed.

B. Short-Term (10-20 years) Landscape Recommendations

Map 21 displays the priority management recommendations for federal lands over the next two decades based on this watershed analysis.

Plantations resulting from past timber harvest are located throughout the watershed. Management in these stands should focus on maintaining conifer stands, promoting their growth and developing habitat conditions. The specific prescriptions will vary, based on the land allocation in which the plantation occurs.

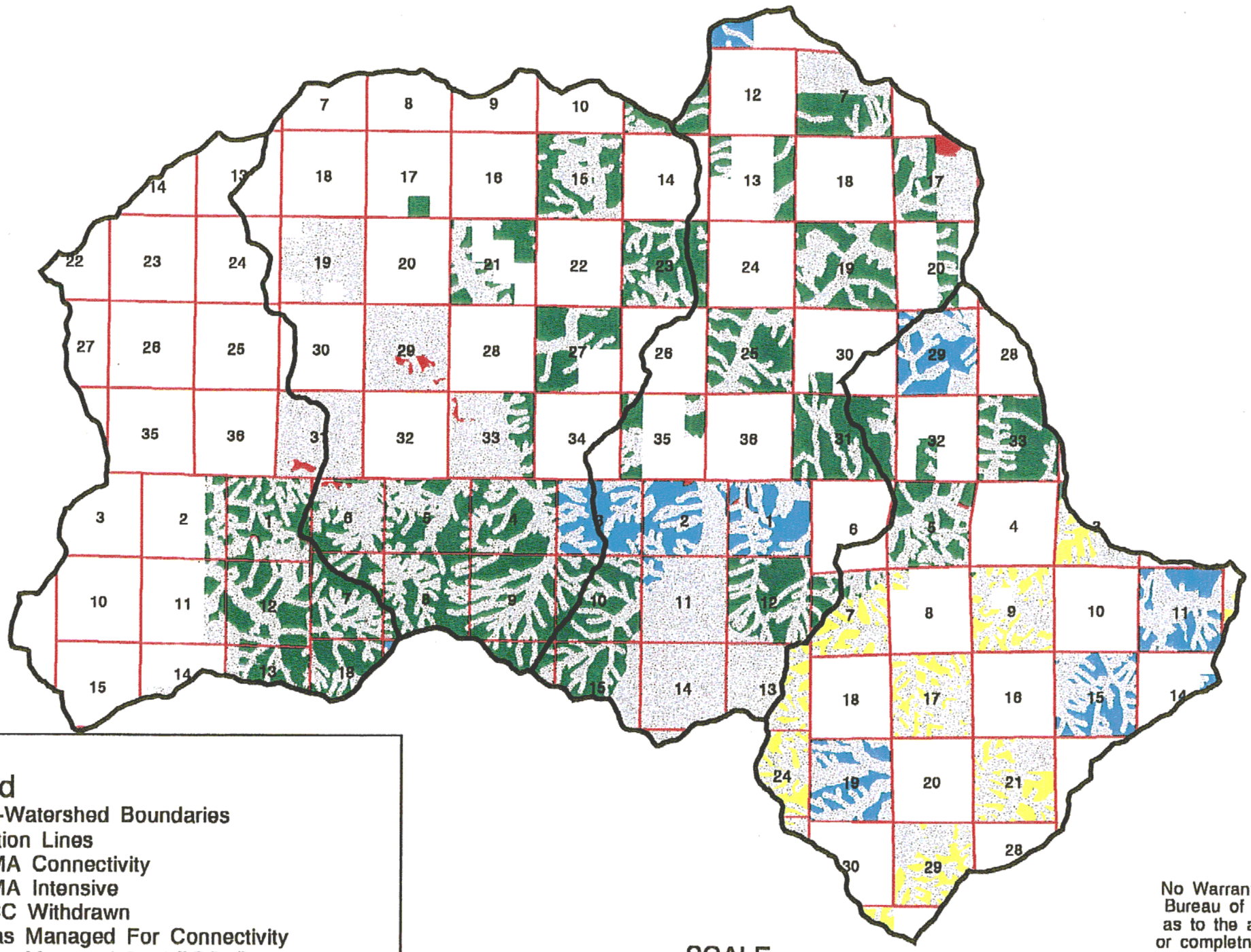
Modified older stands have been partial cut in the past and may not be fully stocked. Management in these stands should promote establishment of fully stocked conifer stands.

Map 20.
West Fork Cow Creek
Long Term Landscape Design

R10W R9W R8W

T31S

T32S



Legend

- Sub-Watershed Boundaries
- Section Lines
- GFMA Connectivity
- GFMA Intensive
- TPCC Withdrawn
- Areas Managed For Connectivity
- Areas Managed for LSOG Conditions

SCALE

2.2 0 2.2 4.4 Miles

No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completness of this data for individual use or aggregate use with other data.

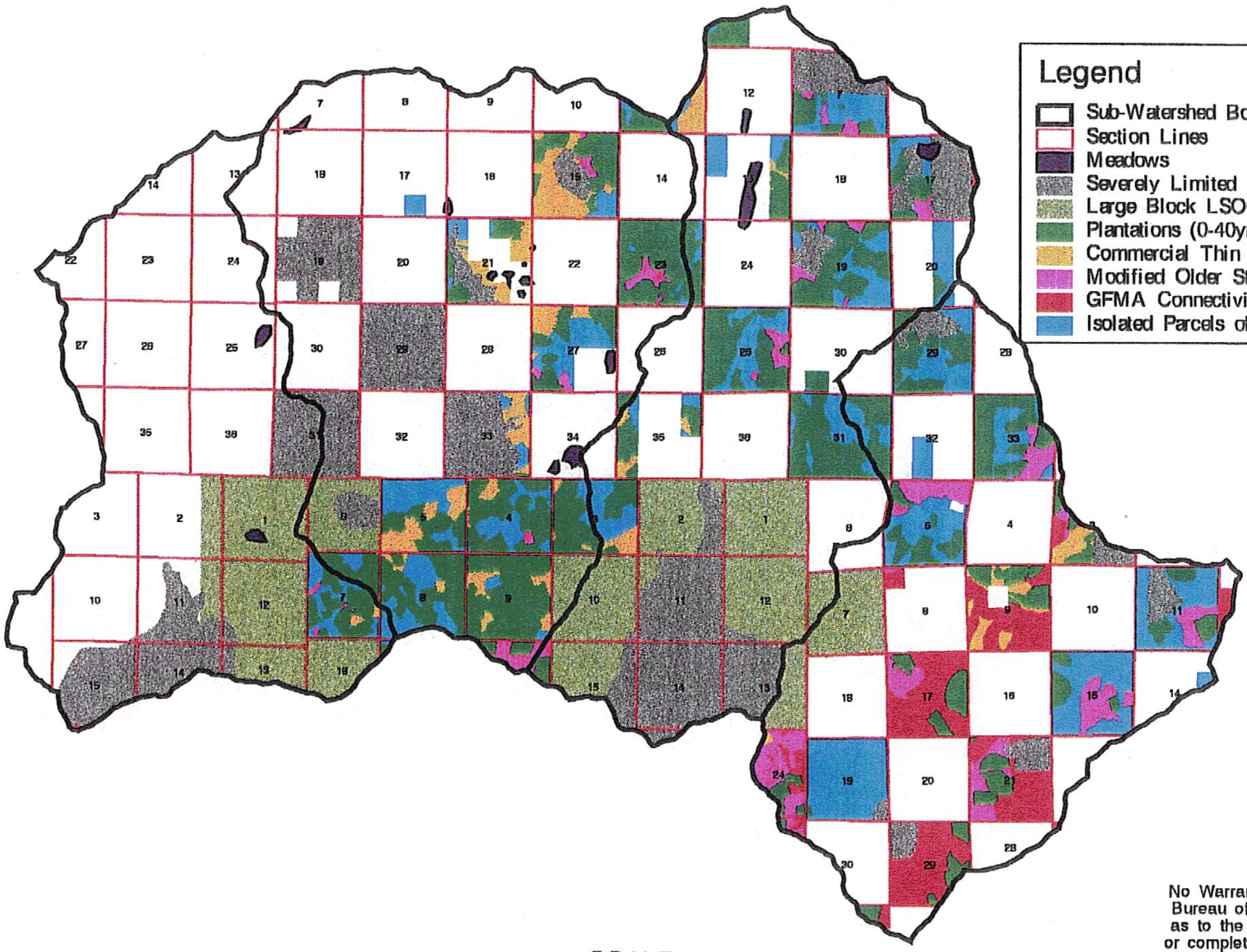
R. PIERLE, 11/21/96

Map 21.
West Fork Cow Creek
Short Term Recommendations

R10W R9W R8W

T31S

T32S



2.2 0 SCALE 2.2 4.4 Miles

No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completness of this data for individual use or aggregate use with other data.

R. PIERLE, 11/21/96

C. Recommendations for Key Issues

Fish Habitat and Hydrologic Effects

Improve and maintain passage for aquatic organisms through all culverts. The fisheries biologist has inventoried the culverts in the watershed and identified problem locations.

Storm-proof all roads to reduce sedimentation, reduce future maintenance costs, and minimize the chances for major road failure.

Decommission unneeded roads, landings and other compacted areas.

Close roads to public motor vehicle traffic to reduce erosion. Close all natural surface roads.

Block up BLM ownership in the watershed. Highest priority for fish concerns include West Fork Cow Creek, Gold Mountain Creek and Elk Valley Creek.

Improve riparian vegetation along fish streams by promoting late-successional habitat conditions.

Improve fish habitat conditions by promoting large wood in the streams, improving shading for water temperature control, and reducing sedimentation as appropriate.

When a road is located within a riparian reserve, allow timber harvesting above the road if it will not adversely affect stream or riparian habitat. Timber harvesting will be recommended on site-specific basis, after on-site investigation determines Aquatic Conservation Strategy goals would be met. Criteria to consider include size and location of road, traffic volume, slope, size of right-of-way clearing and other factors.

Limit transient snow zone openings to less than 25 percent of the watershed.

Develop partnerships with private land owners to cooperatively improve watershed conditions.

Habitat Conditions

Retain largest blocks of existing late-successional forest for interior habitat in the short term.

Maintain a higher level of connectivity in the Bear Creek sub-watershed to promote connectivity between LSRs. In that area, maintain at least 30 percent of the sub-watershed in a late-successional habitat condition.

Improve late-seral structural characteristics of Riparian Reserves where appropriate.

Retain at least 15 percent of the federal lands in a late-successional condition as called for in the RMP.

Maintain spotted owl habitat around more viable owl sites in the short term. Avoid removing suitable habitat around these sites as much as is feasible.

Improve late-successional habitat conditions within the marbled murrelet reserves and spotted owl core areas, using thinning, under burns and other techniques.

Complete the management plan for the Bobby Creek RNA by February 1, 1997.

Conduct surveys for Del Norte salamanders to determine their distribution in the watershed and their habitat associations.

Conduct surveys for coarse woody debris to develop baseline information on undisturbed stands of the various major plant groupings. Develop more site-specific management goals and recommendations for coarse woody debris based on local conditions and processes.

Determine which Survey and Manage species are present in the watershed, what their distributions are, what their habitat associations are, and develop management recommendations.

Elk Management

Close roads to public motor vehicle traffic to reduce harassment and poaching.

Manage timing and location of timber harvest to promote long-term forage availability.

Improve forage where opportunities exist: burn regeneration harvest units, burn meadows, seed skid roads and decommissioned roads.

Acquire high priority habitat: Walker Prairie, Elk Valley Creek, Panther Creek.

Increase law enforcement patrols to reduce poaching.

Human Uses

Two sites were proposed for development under the Glendale - Powers Bicycle Area plan: Bobby Creek RNA overlook, and an overlook for viewing elk from the West Fork Cow Creek Road (Map 17).

The West Fork Cow Creek watershed has a large, solid block ownership area with many opportunities for mountain bike trails using existing roads, jeep roads, and cat trails. Some construction would be necessary to have effective loop trails, with some construction occurring within late-successional stands. Some potential mountain bike loops are illustrated on Map 17 .

There is also interest in designated vehicle tour routes. Vehicle tour routes should be limited to major routes, with the exception of the West Fork Cow Creek Road and Walker Prairie Road. These roads were designated as the preferred route for cyclists under the Glendale - Powers Bicycle Area Project because the grades were less adverse to cyclists than those of the Bobby Creek Access Road. Encouraging vehicles to use the alternate road would limit the amount of vehicle/bike interaction on the narrowest sections of road.

Another measure to consider would be better signing during logging operations to alert both timber haulers and cyclists to the presence of one another.

The Elk Valley Road accesses Camas Valley and Union Creeks and is a popular route for local residents from both sides of the ridge. A large portion of the route is privately owned, with no legal, public access and cannot be designated as a tour route without permission from the owners and possibly purchase of easements, if they would be willing.

The Mount Bolivar trailhead area should not be promoted, but left for self discovery by area visitors to further protect the wilderness quality of the area.

Road Management

Storm-proof and renovate all roads to reduce maintenance cost, reduce chance of major road failure and reduce erosion.

Replace aging culverts.

Conduct routine road maintenance. This should be the highest priority watershed in the Glendale Resource Area for road maintenance. Continue a high level of maintenance on major arterial roads.

Improve safety concerns on West Fork Cow Creek road - straighten dangerous corners.

Reduce fire risk along major travel routes.

Develop partnerships with private land owners to cooperatively manage road systems and use.

Close or surface all natural surface roads, unless they are naturally overgrown and stable.

Keep primary and secondary roads open for public use.

Decommission unneeded roads to reduce road density.

Decommission roads to restrict vehicle access to Bobby Creek RNA.

Update all road agreements to incorporate environmental and public access concerns.

Remove hazard trees along major haul routes.

Forest Products

Conduct commercial thins as they become available to improve growth and yield.

Treat understocked stands (old partial-cuts) to restore to full site productivity.

Harvest timber from small, isolated stands of older forest habitat first, to maintain large blocks in the short term and minimize fragmentation of those larger blocks.

Minimize road construction and other activities which reduce productivity for forest products.

Concentrate reforestation efforts on most productive lands.

Manage activities to reduce the spread of Port Orford cedar root rot and other diseases.

Keep potential mountain bike trails (i.e., skid roads) open while conducting pre-commercial thinning.

Develop and maintain areas to be managed for quality wood products, rather than maximum yield.

Appendix A. Glossary and Acronyms

ASQ	Allowable Sale Quantity
BLM	Bureau of Land Management
CHU	Critical Habitat Unit
CWD	Coarse Woody Debris
ECA	Equivalent Clear-cut Area
GFMA	General Forest Management Area
HUC	Hydrologic Unit Code
LSR	Late-successional Reserve
LWD	Large Woody Debris
NMFS	National Marine Fisheries Service
ODFW	Oregon Department of Fish and Wildlife
PSQ	Probable Sale Quantity
RMP	Resource Management Plan
TPCC	Timber Productivity and Capability Classification
VRM	Visual Resource Management

Appendix B. Key Issues and Key Questions

Key Issues were identified by the ID Team in order to focus the analysis on the important elements of the ecosystem. Suggestions were solicited from the public and landowners in the area.

There are seven issues that are key to meeting the overall ecological objectives in the West Fork Cow Creek WAA. These issues are all interrelated in their process and function. Within these issues, the ID team developed a series of Key Questions that address each issue. The main concerns about these issues are reflected in the Key Questions. In some cases, questions were posed which the team felt could not be answered in the current level of analysis and these are indicated.

It is important to scope out the current and past conditions of the factors affecting these issues before arriving to any management recommendations. In addition, other topics certainly are important in the management of this watershed and will be considered in developing management actions.

The intent is for this analysis to answer the Key Questions based on available data. Where this has not been possible, the reasons for not answering the questions are provided. In several cases, this pointed out future inventory and monitoring needs which were identified, which will be dealt with in future iterations of this analysis.

FISH HABITAT

What effects do the listing of the cutthroat trout, and possibly coho salmon, have on management activities?
What is the current condition of fish habitat?
What areas and factors are contributing to the decline of fish habitat?
What actions or management direction can enhance fish habitat?
What effect do roads have on fish habitat?
What effect does private land have on fish habitat?
What effect does riparian vegetation have on water temperature?
At what point does water quality and quantity affect fish viability?
How does maintenance, improvement and continued use of traditional recreation sites affect fish habitat? And how does fish management affect recreation?
What are the population trends of aquatic species?

HABITAT CONDITIONS

Where is connectivity for species associated with late-successional forests? How does connectivity affect species with high mobility or low mobility?
Where is late-successional habitat within the watershed?
What is the capability of lands in the watershed to provide late-successional habitat?.
What role do riparian and other reserves play in late-successional habitat connectivity?

What plant communities exist and where are they located?
How are forest management activities compatible with late-successional habitat?
What are patch size, edge and fragmentation characteristics of late-successional stands?
What are the quality aspects of late-successional stands?
What are trends in late-successional habitat quality and quantity?
What was the historic late-successional habitat characteristics, quantities and distribution?
What were historic dynamics of habitat changes?
What are the characteristics of late-successional components (e.g., snags, large woody debris) in the watershed?
Where are special habitat features (e.g., meadows, cliffs, caves)?
What are species of concern? What are their distribution, status and trends?
How are northern spotted owls affected by management activities?
What management actions are appropriate within critical habitat units (CHU) designated for the northern spotted owl?
How are late-successional species and spotted owls affected by checkerboard ownership?
Do noxious weeds affect special status plants?
What are the desired future conditions for late-successional habitat in the watershed?
What factors affect late-successional habitat?

ELK MANAGEMENT

What is the current condition of elk habitat?
What areas and factors are affecting elk habitat?
What kinds of actions and activities will enhance elk habitat and view?
What effect do roads have on elk habitat?
What effect does private land have on elk habitat?
Are there sufficient travel corridors for elk travel routes within and between watersheds?
What road closure opportunities exist to enhance elk populations?
How does maintenance, improvement and continued use of traditional recreation sites have on elk management?
What are the population trends of elk?
What effect does poaching have on elk populations in the watershed?

HYDROLOGICAL EFFECTS

What are the current levels of hydrologic parameters (equivalent clear-cut acres, transient snow zone openings, compaction, road density, channel stability, large woody debris)?
What are the major erosional processes?
What are the peak flow discharges (flood intensity)?
What are typical low flow discharges?
What areas contribute most to sedimentation?
What are sub-basins of concern?

What activities are contributing to hydrologic cumulative effects?
What are historic conditions for the watershed parameters?
Where are slide-prone areas and existing slides?

HUMAN USES

What effect will promoting recreation activities have on other resource values?
What are the existing use patterns?
How will road closures affect existing use patterns?
How will encouraging new uses affect existing uses and users?
What are the opportunities for management of recreational mining?
How will elk management activities affect hunting opportunities?
How will the wilderness area affect use of the watershed and vice-versa?
What opportunities exist to enhance enjoyment of bicycle area and the backcountry byway?
How do ownership patterns affect present and future use?
What are the effects of human use on fire risk?
Are there opportunities to improve or increase recreation opportunities?
Where are the cultural sites?

ROAD MANAGEMENT

What are the surface types of roads in the watershed?
What is the status and location of road closures?
What are the locations, conditions, and sizes of road culverts?
What are the road densities in watershed?
What is road maintenance strategy for each road?
Where are the main people travel corridors?
What is the potential for new road construction and where will new roads be built?
Which roads should be decommissioned?
Where are the roads encumbered by agreements with private parties?
Where are the roads with a high level of erosion?
How does present and future road network affect Port Orford cedar root rot?
Where are the unstable areas for road construction?
What are potentials for mountain bike use of roads?
What is the status of noxious weeds and how does the road network affect their spread?
What management direction is appropriate for archaeological site located in roads?

FOREST PRODUCTS

What are the primary forest products in the watershed?
How much timber volume exists now and what is its availability with the current land use allocations and management directions?
In which sub-basins is the timber volume located?
What is the projected volumes and sustainability of timber harvest in the watershed?
What effect do reserves have on timber and special forest product (SFP) availability?

What are the status and locations of SFP markets?
How much forest land is considered understocked? What are the effects on availability and sustainability of timber harvest?
What factors affect timber productivity and where?
How important are diseases, insects and windthrow?
What are the risks and hazards of fire loss to forest products?
What effect does fire exclusion have on products?
How important are noxious weeds on reforestation and SFPs, especially scotchbroom?
How does access affect production?
What is the current forest seral stage distribution?
What is the capability of land for forest products?

Siskiyou Mountains Matrix of Factors and Indicators

Factors	Indicators	Properly Functioning	At Risk	Not Properly Functioning
Water Quality	Maximum Water Temperature (7-day max average)	2nd through 4th order streams <66 degrees F. >5th order stream <70 degrees F.	2nd through 4th order streams 66-69 degrees F. >5th order stream 70-74 degrees F.	2nd through 4th order streams ≥70 degrees F. >5th order stream >74 degrees F.
	Sediment and Turbidity	<20% fines (sand, silt, clay) in gravel, relatively low turbidity		>20% fines (sand, silt, clay) in gravel, high turbidity
Habitat Access	Physical Barriers	No human-made barriers to prevent passage of age 1+ salmonids	Few human-made barriers prevent passage of age 1+ salmonids	Human-made barriers prevent upstream and downstream passage of age 1+ salmonids
≤3% Habitat Elements (focus on conditions in low gradient, unconfined stream segments{LGS}, usually alluviated canyons or alluvial valleys, Frissell, 1986)	Large Wood Material {LGS}	(1.4/100m) >25 pieces/mile (Siskiyous east), >40 (2,3) pieces per mile (Siskiyou west); >24 inches in diameter and >50 ft. in length or 2X bankfull width (BFW). Little stream cleanout or management related landslides	(0.6-1.4) (1.4-2.3) 10-25 (east), 25-40 (west) pieces per mile >24 inches in diameter and >50 ft. in length or 2X BFW. Some stream cleanout and/or mangement related landslides	(0.6) (1.4) <10(east), <25(west) pieces per mile >24 inches in diameter and >50 ft. in length or 2X BFW. Stream cleanout and/or management related landslides widespread
Gravel, cobble, sand dependent area rather than cascade step pool. Side channels, lateral scour pools	Substrate {LGS}	Dominant substrate is gravel and cobble; interstitial spaces clear	Gravel/cobble subdominant, moderate embeddness	Bedrock, sand, silt or small gravels dominant or embedded cobbles

Factors	Indicators	Properly Functioning	At Risk 	Not Properly Functioning
Flow/Hydrology	Changes in Peak Flows (consider effects at watershed scale)	Timber harvest and roads have done little to influence the hydrologic regime of the watershed. Little extension of channel network	Moderate amounts of timber harvest and roads have influenced the hydrologic regime of the watershed, some increase of channel network.	High levels of timber harvest and roads have effected the hydrologic regime of the watershed. Considerable increase in channel network.
Watershed Conditions	Road Density and Location	Road density <2 miles/square mile, valley bottom roads not restricting stream meanders,affecting riparian function	Road density 2-3 miles/square mile, some valley bottom roads restricting stream meander, riparian function	Road density >3 miles/square mile, valley bottoms well-roaded and affecting stream channel meanders,riparian
	Disturbance History (consider effects at watershed scale)	Little harvest and road activity (<5% ECA/decade) with no concentration in unstable areas or riparian reserves; ≥15% retemtion of mature forests in watershed (LSOG)	Moderate harvest and road activity (<5% ECA/decade), with disturbance concentrated in unstable areas, refugia or riparian reserves; ≥15% retemtion of mature forests in watershed	Widespread harvest and road activity (>5% ECA/decade) with disturbance concentrated in unstable areas, refugia or riparian reserves. Does not meet NWFP standards for LSOG retention .
	Riparian Reserves	Intact riparian reserves, >80% in late seral condition. Little or no evidence of salvage, sufficient down wood	Altered riparian reserves, 60-80% in late seral condition. Evidence of salvage and down wood deficient	Substantially altered riparian reserves, <60% in late seral condition. Extensive salvage, down wood lacking
	Landslide Rates (consider at watershed scale)	Landslide rate within 10-20% of historic or few obvious increaes over natural rates. Stream conditions not altered by human-caused landslides	Some watersheds with >20% of landslides related to management activities. Some obvious increases in occurence.Stream conditions may be altered by landslides from management activities.	Many watersheds with >25% of landslides related to land management activities. Stream conditions obviously altered by human activities

Factors	Indicators	Properly Functioning	At Risk 	Not Properly Functioning
Habitat Elements	Pool Character ≥3rd order streams {LGS}	>30% pool habitat by area; little evidence of pool filling w/fines	<30% pool habitat by area; some evidence of pool filling w/fines	<30% pool habitat by area; widespread evidence of pool filling w/fines
	Off-Channel Habitat {LGS}	Active side channels relatively frequent; backwater areas present; related to large wood, nick point, etc.	Relatively few active side channels, backwater areas. Evidence of abandoned side channels due to past management activities	Few or no active side channels, backwater areas. Evidence of abandonment. Side channels formed from aggradation of channel
	Refugia	Habitat refugia exist and adequately buffered. Connectivity and abundance sufficient to maintain viable sub-populations.	Habitat refugia exist but not adequately buffered. Connectivity and abundance insufficient to maintain viable sub-populations.	Adequate habitat refugia does not exist.
Channel Conditions and Dynamics	Width Depth Ratios by Channel Type	Width/Depth ratios and channel types within historic ranges and site potential within watershed	Width/Depth ratios and channel types partially outside historic ranges and site potential within watershed	Width/Depth ratios and channel types throughout the watershed are well outside of historic ranges and/or site potential
			Rosgen Type A,E,G B,C,F D	W/D Ratio <12 12-30 >40
	Streambank Condition	Stable stream banks, little evidence of eroding banks.	Moderately stable, some streambank erosion evident	Unstable stream banks, numerous areas of exposed soil and cutting
	Floodplain Connectivity {LGS}	Off channel areas frequently linked to main channel, floods frequently connect stream to floodplain and riparian zone	Reduced floodplain connection to main channel, some evidence of lowering water tables on floodplain	Greatly reduced connectivity between main channel and off channel habitats and riparian areas

Appendix D. Hydrologic cumulative effects for seventh field watersheds (HUC 7) within the West Fork Cow Creek watershed.

Stream Name	HUC #	% ECA	% CA	TSZ	Road Density
Bolivar Creek	CW0103W	0.0	0.0	0.0	0.0
West Fork Cow - above Bolivar Cr	CW0106W	9.7	6.5	22.0	4.4
WF Cow - below Bolivar Cr & above Wilson Cr	CW0109F	4.9	7.3	0.0	6.9
Wilson Creek	CW0112W	6.2	2.5	13.4	3.6
WF Cow below Wilson Cr & above undefined point in 31S 10W 36 SE¼NW¼	CW0115F	9.0	5.7	46.4	3.9
WF Cow below undefined point in 31S 10W 36 SE¼NW¼, above Stanley Cr	CW0118F	5.0	11.7	42.7	4.7
Stanley Creek	CW0203W	5.4	9.1	21.8	5.7
WF Cow - below Stanley Cr & above Slide Cr	CW0206F	7.8	8.9	3.3	2.1
Slide Creek	CW0209W	7.7	4.0	21.0	3.8
WF Cow - below Slide Cr & above Walker Cr	CW0212F	2.0	8.9	0.0	2.1
Wallace Creek	CW0215W	8.4	5.7	26.4	3.9
Walker Creek above Wallace Cr	CW0218W	9.0	6.2	24.3	5.2
Walker Creek below Wallace Cr, above WF Cow confluence	CW0221F	3.1	1.5	0.0	3.3
WF Cow below Walker Cr, above Gold Mt Cr	CW0224F	2.1	6.2	0.0	4.0
Gold Mountain Creek	CW0227W	10.5	12.6	41.2	4.8
WF Cow below Gold Mt Cr, above Panther Cr	CW0230F	5.0	7.7	0.0	5.3
Panther Creek	CW0233W	12.5	11.0	30.1	5.3
WF Cow below Panther Cr, down to & including unnamed trib in 31S-5W-26 NW¼SW¼	CW0236F	4.8	8.3	34.7	4.4
WF Cow below unnamed trib in 31S-5W-26 NW¼SW¼, above Elk Valley Cr	CW0303F	2.5	7.3	0.0	2.7
Elk Valley Cr, above Elk Valley Cr-East Fk	CW0306W	8.2	12.0	19.5	3.8
Elk Valley Cr - East Fork	CW0309W	10.7	8.7	12.2	4.1
Elk Valley Cr, below Elk Valley Cr-East Fk above WF Cow confluence	CW0312F	10.5	8.6	16.9	4.2
WF Cow below Elk Valley Cr, above Finger Cr	CW0315F	6.9	9.8	0.0	4.6
Finger Creek	CW0318W	13.4	5.1	3.9	5.1
WF Cow below Finger Cr, above Bobby Cr	CW0321F	7.5	12.9	0.0	3.9
Bobby Crk-W. Fork	CW0324W	12.6	3.0	29.1	3.8
Bobby Crk-E. Fork	CW0327W	3.7	1.3	9.3	2.0
Bobby Cr below E/W fork confluence, above WF Cow confluence	CW0330F	11.1	3.4	21.2	3.5
WF Cow below Bobby Cr, above North Sweat Cr	CW0333F	2.7	3.6	0.0	2.9

Stream Name	HUC #	% ECA	% CA	TSZ	Road Density
North Sweat Creek	CW0336W	1.4	1.3	14.4	2.5
WF Cow below North Sweat Cr, above Sweat Cr	CW0339F	4.0	6.2	38.8	1.9
Sweat Creek	CW0342W	2.1	3.3	5.5	2.7
WF Cow below Sweat Cr, above Soldier Cr	CW0345F	6.1	5.9	16.1	5.6
Soldier Creek	CW0403W	15.3	8.1	23.9	7.1
WF Cow below Soldier Cr, above Hayes Cr	CW0406F	2.0	1.3	0.0	3.3
Hayes Creek	CW0409W	18.1	7.6	43.7	5.9
WF Cow below Hayes Cr, above Slotted Pen Cr	CW0412F	5.7	4.7	58.3	3.1
Slotted Pen Creek	CW0415W	13.4	11.4	38.0	5.2
WF Cow below Slotted Pen Cr, above Honeysuckle Cr	CW0418F	4.4	5.9	0.0	2.5
Honeysuckle Creek	CW0421W	5.0	6.7	4.5	6.1
WF Cow below Honeysuckle Cr,above Goat Trail Cr	CW0424F	10.9	5.6	0.0	5.5
Goat Trail Creek	CW0427W	15.9	6.3	21.8	5.2
WF Cow below Goat Trail Cr, above Bear Cr	CW0430F	4.6	6.8	26.3	4.2
Bear Creek - West Fork Cow	CW0433W	9.3	6.6	20.5	4.5
WF Cow below Bear Cr, above Jacob Cr	CW0436F	4.3	10.2	0.0	6.3
Jacob Creek	CW0439W	6.4	9.2	8.7	7.9
WF Cow below Jacob Cr, above Cow Cr confluence	CW0442F	11.5	7.7	60.0	4.4
Number of sub-watersheds above trigger values		0	35	13	15

ECA - Equivalent Clearcut Area	Trigger Value = 25 %
CA - Compacted Area	Trigger Value = 5 %
TSZ = Transient Snow Zone Openings	Trigger Value = 25%
Road Density	Trigger Value = 5 miles/square mile

Appendix E. Major Plant Groupings within the West Fork Cow Creek watershed.

The Douglas-fir/tanoak/madrone grouping is characterized by an overstory of Douglas-fir with a minor component of sugar pine. Understory vegetation is dominated by tanoak (in both tree and shrub form), Pacific madrone, golden chinquapin, dwarf Oregon grape, salal, and varnishleaf. This grouping is distributed throughout the central and eastern portions of the watershed on all aspects.

An association within the Douglas-fir/tanoak-madrone grouping is the Douglas-fir/tanoak/canyon live oak subgroup. These sites are characterized by an overstory of Douglas-fir with a secondary component of sugar pine, incense cedar and ponderosa pine. Understory vegetation is dominated by canyon live oak, tanoak, dwarf Oregon grape and poison oak. This subgroup dominates the southerly aspects and the shallow soils. The Bear Creek subwatershed is dominated by this plant grouping.

Another area in the west central portion of the watershed sits on ultramafic rock derived soils. This subgroup of the Douglas-fir/tanoak-madrone grouping demonstrates a noticeable increase in sugar pine and decrease in Douglas-fir in the overstory. The other vegetative components are similar to the major Douglas-fir/tanoak-madrone grouping, with the addition of Pacific rhododendron.

The mixed conifer/madrone-deciduous brush/salal grouping is characterized by an overstory of Douglas-fir and a minor component of sugar pine, white fir, western hemlock, incense cedar, western red cedar, and occasional Port Orford cedar. Understory vegetation is variable with salal, dwarf Oregon grape, Pacific rhododendron, evergreen huckleberry, golden chinquapin, and madrone being the most common with tanoak present in lesser amounts. This grouping occurs primarily on northerly aspects and along the higher elevations encompassing most of the western portion of the West Cow Creek watershed.

An inclusion that is mapped in the western portion of the watershed including Stanley Creek is considered a true mixed conifer subgrouping. It is dominated by an overstory of sugar pine, Douglas-fir, incense cedar, Port Orford cedar, western red cedar, and ponderosa pine. The understory is typical of the mixed major grouping already described.

Other special habitat features such as rock outcrops, cliffs, caves and talus slopes occur throughout the watershed as scattered, small inclusions in the forest matrix.

On the northwest edge of the West Fork Cow Creek watershed in the mixed conifer grouping, a sandstone ridge dominates the landscape. It extends from Elk Valley Creek in the east to Stanley Creek in the west. This area displays a vegetative community which

is noticeably nutrient deficient. The vegetation is chlorotic and slow growing particularly in areas where soils have been disturbed.

An even smaller inclusion of a vegetation grouping, but very distinct, is the white oak/savanna grouping. This occurs primarily in isolated small valleys and rocky flats with shallow soils on flat ridges. It is dominated in the overstory by white and black oak and occasional ponderosa pine and Douglas-fir, with grass as the primary ground cover. The reduction in the occurrence of wildfire, it is believed, has allowed for the encroachment of young Douglas-fir and some ponderosa pine in the understory along with increases in the amount of wedgeleaf ceanothus and manzanita.

In each of these vegetation types, the early seral vegetation is somewhat different than the vegetation in the understory of a forest in a later seral stage. Varnishleaf ceanothus and deer brush ceanothus are often dominant early seral shrub species on all but the drier, rocky shallow soil sites such as in the serpentine, sandstone, and oak/savanna areas. Manzanita is an early seral species on the drier sites, such as the canyon live oak subgroup, along with canyon live oak.

Another important, but small vegetation type in the watershed include dry and wet meadows. These are shown on Map 7. The most important meadows are those in Elk Valley Creek drainage. In other places, such as Walker Prairie, the meadow conditions blend into an oak/pine savannah which is dominated by grass and forbs, with scattered large white oaks and ponderosa pines.

Appendix F. Wildlife Species of Concern

Species	Status	Presence/ Inventory	Habitat	Monitoring
Peregrine Falcon	FE,ST	S/N	U	N
Bald Eagle	FT, ST	D/2	Y	N
Northern Spotted Owl	FT, ST	D/4	Y	Y
Marbled Murrelet	FT, ST	U/3	Y	N
Umpqua Cutthroat Trout	FE	D/3	Y	Y?
Del Norte Salamander	SM,BS, SV	D/3	Y	N
Red Tree Vole	SM	D/3	Y	N
Great Gray Owl	SM	U/N	Y	N
Spotted Frog	FC, SU	U/N	U	N
Western Pond Turtle	BS, SC	D/3	Y	N
Cascades Frog	BS, AS, SC,	U/N	N	N
Mtn. Yellow-legged frog	BS, SU	U/N	N	N
Red-legged Frog	BS, SU	U/N	U	N
Northern Goshawk	BS, AS, SC	D/2	Y	U
Mountain Quail	BS	D/3	Y	N
Townsend's Big-eared Bat	BS, SC	S/3	Y	U
White-footed Vole	BS, SP	U/N	U	U
Fisher	BS, AS, SC	U/N	Y	U
Wolverine	BS, ST	U/N	N	N
Burnell's False Water Penny Beetle	BS	U/N	U	U
Denning's Agapetus caddisfly	BS	U/N	U	U
Green Springs Mtn. farulan caddisfly	BS	U/N	U	U
Schuh's homoplectran caddisfly	BS	U/N	U	U
Obrien rhyacophilan caddisfly	BS	U/N	U	U
Siskiyou caddisfly	BS	U/N	U	U
Alsea ochotrichian micro caddisfly	BS	U/N	U	U
Franklin's bumblebee	BS	U/N	U	U

Species	Status	Presence/ Inventory	Habitat	Monitoring
Oregon pearly mussel	BS	U/N	U	U
Fringed Myotis	SM,BS, SV	U/N	U	U
Clouded salamander	AS, SC	D/3	Y	N
Tailed Frog	AS, SV	S/N	U	U
Black Salamander	AS, SP	U/N	U	U
California slender salamander	AS, SP	U/N	U	U
California Mountain King Snake	AS, SP	U/N	U	U
Common King snake	AS, SP	S/N	Y	U
Pileated Woodpecker	AS, SC	D/3	Y	U
Black-backed Woodpecker	AS, SC	U/N	U	U
Three-toed Woodpecker	AS, SC	U/N	U	U
Flammulated Owl	AS, SC	D/N	U	U
Purple Martin	AS, SC	U/N	U	U
Great Gray Owl	AS, SV	U/N	U	U
Western Bluebird	AS, SV	U/N	Y	U
Pacific Pallid Bat	AS, SC	U/N	Y	U
Pine Marten	AS, SC	U/N	Y	U
Coho Salmon	AS, SC, SD	D/3	Y	Y
Steelhead trout(Winter run)	AS	D/3	Y	Y
Steelhead trout(Summer run)	AS	D/3	Y	Y
Chinook salmon	AS, SC	D/3	Y	Y

Status:
FE - Federal Endangered
FT - Federal Threatened
FP - Federal Proposed
FC - Federal Candidate
SM- Survey and Mange
BS - Bureau Sensitive
AS - Assessment Species (BLM)
SE - State Endangered
ST - State Threatened
SC - State Critical
SV - State Vulnerable
SP - State Peripheral or Naturally Rare

Presence:
D - Documented
S - Suspected
U - Uncertain
A - Absent

Inventory
N - No surveys done:
1 - Literature search only
2 - One field search done
3 - Limited surveys done
4 - Protocol completed

Habitat:
N - Habitat is not present
Y - Habitat is present
U - Uncertain

Monitoring:
N - None planned or completed
U - More information needed to monitor
NA - Not Applicable
Y - Currently being monitored

Appendix G. Fire Risk and Hazard Analysis

Fire has played an important role in the West Fork Cow Creek watershed; the 1953 aerial photographs show a pronounced mosaic of burned and unburned stands and the 1916 revestment surveys (on file in the Medford District BLM office) contain frequent references to major burns.

The interdisciplinary team analyzed the importance of fire in the current landscape using a qualitative model using three parameters: fire hazard, fire risk and resource value.

Fire Hazard: Fire hazard is dependent on the fuels, slope and aspect. In the West Fork Cow Creek watershed, the highest fire hazard is associated with recent precommercial thinning activity. This high hazard generally persists for 2-4 years until the slash decomposes to some extent. These units exist as isolated, scattered units located throughout the watershed. Unthinned plantations 10-30 years old (common on private lands) were designated as moderate hazard. Such stands are widespread on private lands and dominate the landscape in the northern and northwestern part of the watershed.

Fire risk: The risk of wildfire involves the probability of ignition. A review of the ZAP database of recent lightning strikes did not reveal any distinct areas of high lightning occurrence, so it was assumed that the probability of a lightning strike was relatively uniform across the watershed. Thus, the major determinant of fire risk was where human use was greatest. In the West Fork Cow Creek watershed these areas occurred along major travel routes through the watershed; primarily the east-west road along the southern boundary, the West Fork Cow Creek road itself and the north-south road through Elk Valley. Recreation sites were also primary risk sites.

Resource Value: High value sites included progeny test sites, the Bobby Creek RNA/ACEC and dispersed recreation sites. The bulk of the private and federal forest land was designated a moderate value resource.

Those places in the watershed where all three factors were rated as “high” were determined to be the highest priority for fuels and fire management (Map B-1). High risk, high hazard and high resource value in the same location indicated “hot spots” where management attention was most important. In the West Fork Cow Creek watershed there were very few locations where all three factors were rated “high.” This is generally a result of the remote nature of the watershed which limited risk, the relatively low value since there are no residences or towns, and a fairly uniform hazard. The only “hot spots” identified occurred along major roads where existing recreation sites are known to be used. And even in these situations a major fire in the vicinity would probably not reduce recreational use since most sites occur on large landings or rock stockpile sites.

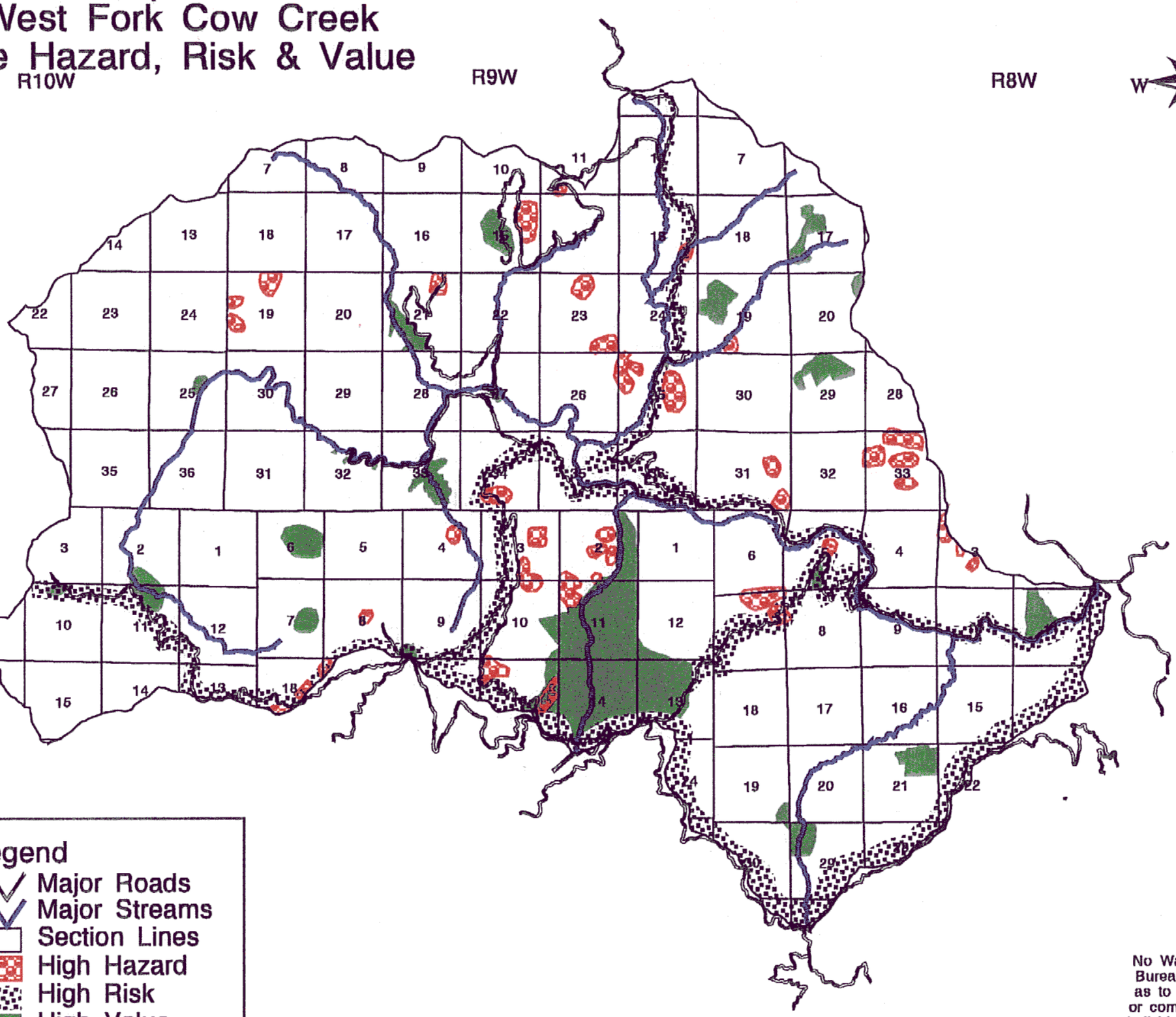
Recommendations:
-Treat areas to the east and west of Bobby Creek RNA to reduce likelihood of wildfire moving into RNA.
-Treat areas along major travel routes to minimize risk of ignition.

Map G-1.
West Fork Cow Creek
Fire Hazard, Risk & Value

R10W R9W R8W

T31S

T32S



Legend

- Major Roads
- Major Streams
- Section Lines
- High Hazard
- High Risk
- High Value

2.2 0 SCALE 2.2 4.4 Miles

No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completness of this data for individual use or aggregate use with other data.

R. PIERLE, 11/21/96

Appendix H. Literature Cited

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